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Into the Stubble

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WINTER FATTENING OF BULLOCKS WITH GRASS SILAGE

PROFESSOR J. MORRISON and W. A. STEPHENSON, B.Agr.
Agricultural Research Institute, Hillsborough, Co. Down

DURING the winter 1948–49 a feeding trial carried out at the Institute showed that it was possible to fatten bullocks satisfactorily and profitably on a ration composed entirely of grass silage. The trial was described in the May, 1949, issue of this JOURNAL. One group of bullocks consumed up to 126 lb. silage per head daily and made a liveweight increase of 2.8 lb. per head daily. Another group of the same initial weight received a daily ration of just over 100 lb. silage, plus 4 lb. crushed oats, and made a daily liveweight increase of 2.4 lb. In this group no apparent advantage was obtained by feeding oats in addition to the high silage ration. The bullocks were approximately 10 cwt. live weight and in forward condition at the beginning of the trial, and were sold fat at approximately 12 cwt. live weight after a feeding period of just over three months.

It was recognized, however, that in general Northern Ireland farmers start winter fattening with smaller animals in less forward condition than those used in the first trial, and having this in mind it was decided to use lighter bullocks in the second feeding trial carried out during the winter 1949–50.

Ten bullocks of Shorthorn type were bought for this trial and arrived on the farm on January 13, 1950. They received a sharp setback just after arrival, as several of the animals, having been sent to an outlying field over the weekend, ate rhododendron and suffered from severe poisoning. On veterinary advice, food and water were withheld and each bullock was drenched with 1 pint of raw linseed oil. By January 17 the bullocks had recovered sufficiently to start preliminary feeding with silage and a little hay. On January 19 they were weighed, divided at random into two approximately equal groups and housed in adjoining loose boxes. Those in Group 1 averaged 9 cwt. 1 qr. 4 lb., and those in Group 2, 9 cwt. 1 qr. 6 lb. live weight.

Two Ration Groups Two different rations were designed as nearly equal as possible in feeding value measured on a starch equivalent basis : Group 1 to get grass silage only, and Group 2 to get a ration of a more practical nature which could be fed by farmers who might have a limited quantity of silage, together with hay and some oats. The rations were as follows :

Group 1 Silage only, fed to capacity.
Group 2 Silage 50–60 lb. ; hay 7–8 lb. ; oats 5–6 lb.

It may be mentioned here that the grass silage had been made in a trench silo holding 50 tons of green grass. The grass was cut at the end of May, 1949,

from a three-year-old ley which had received a basal dressing of 3 cwt. per acre compound manure in March, and 1¼ cwt. nitrogenous fertilizer per acre about 14 days before cutting began. A yield of 5¾ tons per acre of grass was obtained. Molasses was added at the rate of 2 gallons per ton of green grass, and, when filled, the silo was sealed and weighted with about 5 inches of soil and covered with a removable corrugated iron roof.

By the time the filling of the silo was finished, the grass was well into flower, and in consequence the silage was of medium protein quality. Nevertheless it was quite capable of supplying maintenance and production requirements for the bullocks. Ten representative samples of the silage taken at different points in the silo were analysed by the Chemical Research Division of the Northern Ireland Ministry of Agriculture. The silage, yellow and greenish-brown in colour, was described in the analysis reports as being of excellent quality with an average protein content. The following was the average analysis :

Dry matter	22.64 per cent
Crude protein in dry matter	12.82 " "
Starch equivalent*	13.0
*p*H	3.83

* Calculated from average starch equivalent value of 57.5 for the dry matter of grass silages (Watson, S. J. (1939) The Science and Practice of Conservation).

The hay fed to the bullocks in Group 2 was cut from first-year seeds ley. It appeared to be of excellent quality, but as it contained practically no clover the protein content was low. Samples were analysed by the Chemical Research Division and gave the following average analysis :

Moisture	10.13 per cent
Crude protein	6.15 " "
Fibre	29.91 " "
Estimated starch equivalent†	38.3

† Calculated from regression equation for hays (Watson, S. J. (1939) The Science and Practice of Conservation).

The oats, grown on the farm, were fed to Group 2 freshly crushed, the feeding value being taken at the recognized starch equivalent figure of 60.

To enable the bullocks to get accustomed to the silage, a preliminary feeding period was necessary. This began on January 17, and by January 30 the bullocks were nearly up to full rations. Thereafter silage was fed to capacity to Group 1, and the maximum amount eaten per head per day was 118 lb. In Group 2 the corresponding maximum amounts eaten were 60 lb. silage, 8 lb. hay, and 6 lb. oats.

The experimental feeding period began on February 7, when the bullocks were again weighed, and as far as possible subsequent weighings were made at fourteen-day intervals. Weighings were made before feeding between seven-thirty and eight o'clock in the morning, so that a considerable period of time had elapsed between feeding in the evening and weighing on the following morning.

As in the previous experiment, the silage had a laxative effect on the bullocks, causing them to scour freely at first. The silage group remained loose in the dung throughout the feeding period, whilst the bullocks in Group 2 practically returned to normal in this respect. In the first few weeks, however, it was difficult to keep the bedding dry and in consequence the bullocks became caked with dung. This gave spectacular increases in the

weights of some of the bullocks at the beginning of the experimental period. At the end of the trial all the bullocks were reasonably free of dung, especially those in Group 2.

Table 1 gives the food consumption for each group of bullocks during the experimental period, and Table 2 shows the liveweight gains. It was not possible to keep the starch equivalent intake of both groups exactly alike as the trial progressed. The total intake by Group 1 was somewhat higher than that by Group 2, and a rather better liveweight increase might have been expected in Group 1. On the other hand, the average consumption of S.E. per lb. liveweight increase (5.76) in Group 2 agrees quite well with the theoretical requirement (5.78) for a bullock of 10½ cwt. gaining 2½ lb. per day.

The periodic weighings showed considerable variation in the gains made during the trial. It is difficult to account for this variation, but as already mentioned it could be attributed, at least in part, to the dung adhering to the bullocks in the initial stages of the trial and probably also to the stomach contents at time of weighing. Some of the bullocks in Group 1 actually lost weight in the last week. A few feeds of silage from another silo had to be given to finish the week, but the bullocks continued to consume the same quantity as before and it was unlikely that this was a contributory factor to loss in weight. The overall trend, however, is obvious. The bullocks put on flesh, and their liveweight gains were very satisfactory on both rations.

As the trench silo was empty at the end of the ninth week of the experimental period, it was decided to dispose of the bullocks and the trial finished on April 11. They were weighed early in the morning before leaving the farm and passed through the grading centre that day. The grading results were :

Group	No. of Bullocks in each Grade			
	SS	S	A+	A
1	1	2	2	—
2	1	1	2	1

As in the previous trial, expert opinion was obtained on the carcasses at the abattoir. There was nothing to choose between the two groups, and without exception all the carcasses were excellent in quality and in colour of fat. This opinion was confirmed by different butchers to whom the meat was allocated.

Higher Financial Return from Silage Group The financial aspect of this trial is interesting, just as was that of the trial carried out the previous year. The prime cost of the silage actually fed to the bullocks, including all items of direct expenditure in the production and making of the silage, but excluding rent and overheads, was 34s. per ton. The hay is charged at £7 10s. and the oats at £21 per ton. No credit has been allowed for the manure weighed out of the loose boxes (33 tons) and no

TABLE 1 FOOD CONSUMPTION

	Date of Weighing	Total Weight of Groups	Since Previous Weighing					Average Consumption of S.E. per lb. Liveweight Increase
			Silage consumed	Average Consumption of silage per head per day	Oats consumed	Hay consumed	Estimated S.E. intake	
	1950	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*	*lb.*
GROUP 1 (Silage only)	February 7	5,355	—	—	—	—	—	—
	22	5,537	7,987	106.5	—	—	1038.3	
	March 7	5,859	7,497	115.3	—	—	974.6	
	21	5,939	8,228	117.5	—	—	1069.6	6.17
	April 5	6,209	8,848	118.0	—	—	1150.2	
	11	6,114	3,479	116.0	—	—	452.3	
	Totals		36,039	114.4 (Average)	—	—	4685.0	
GROUP 2 (Silage, Oats and Hay)	February 7	5,386	—	—	—	—	—	
	22	5,481	3,955	52.7	450	483	969.1	
	March 7	5,834	3,846	59.2	390	482	918.6	
	21	5,936	4,214	60.2	420	567	1017.0	5.76
	April 5	6,111	4,515	60.2	450	604	1088.3	
	11	6,153	1,767	58.9	180	234	427.3	
	Totals		18,297	58.1 (Average)	1,890	2,370	4420.3	

TABLE 2 LIVEWEIGHT GAINS

	Date of Weighing			Average Weight per Bullock	Period since Previous Weighing	Average Gain per Head per Day	
						Since previous weighing	During experimental period
	1950			*cwt. qr. lb.*	*days*	*lb.*	*lb.*
GROUP 1 (Silage only)	Preliminary Period	January	19	9 . 1 . 4	—	—	—
			30	9 . 0 . 22	11	−0.9	—
	Experimental Period	February	7	9 . 2 . 7	8	5.1	2.41
			22	9 . 3 . 15	15	2.4	
		March	7	10 . 1 . 24	13	5.0	
			21	10 . 2 . 12	14	1.1	
		April	5	11 . 0 . 10	15	3.6	
			11	10 . 3 . 19	6	−3.2	
GROUP 2 (Silage, Oats and Hay)	Preliminary Period	January	19	9 . 1 . 6	—	—	—
			30	9 . 1 . 10	11	0.4	—
	Experimental Period	February	7	9 . 2 . 13	8	3.9	2.44
			22	9 . 3 . 4	15	1.3	
		March	7	10 . 1 . 19	13	5.5	
			21	10 . 2 . 11	14	1.4	
		April	5	10 . 3 . 18	15	2.3	
			11	10 . 3 . 27	6	1.5	

charge has been made for straw used as bedding or for the labour of carting away the manure.

	£ s. d.	£ s. d.
GROUP 1 (Silage only)		
Selling price (5 bullocks)	301 14 0	
Purchase price ,,	230 0 0	
Gross Margin		71 14 0
Direct Costs		
Silage (20 tons)	34 0 0	
Labour	5 5 0	39 5 0
Surplus over direct costs		£32 9 0
GROUP 2 (Silage, Hay and Oats)		
Selling price (5 bullocks)	303 15 0	
Purchase Price ,,	230 0 0	
Gross Margin		73 15 0
Direct Costs		
Silage (10½ tons)	17 17 0	
Hay (21¼ cwt.)	7 19 4	
Oats (17¾ cwt.)	18 7 6	
Labour	5 5 0	49 8 10
Surplus over direct costs		£24 6 2

The results of this trial, although again from only ten animals, have in great measure confirmed those of the previous year and support the contention that cattle can be fattened profitably during winter on a ration consisting in whole or in part of grass silage. Whilst the group fattened on silage alone left a larger surplus over costs, it is recognized that such a ration would not be practicable on the majority of farms. On the other hand, the ration fed to Group 2, composed entirely of home-grown foods, is well within the scope of many farmers, large and small. The cattle used for the trial were average stores when purchased, and for three months' winter feeding they put on weight and flesh roughly comparable with what would be obtained on grass over a similar period.

Two points may be mentioned in the light of the experience gained with winter fattening at the Institute. In the first place it must be remembered that grass silage was used and not arable crop silage. Moreover, the silage fed in both years was of excellent quality, not in the sense that it was high protein silage, although the protein content was sufficient for the particular purpose, but it was well made and very palatable to the animals. It is doubtful if crop silage, having on the average a lower starch equivalent than first-cut grass silage, would give as good results. This would be a useful field for further trials. In the second place the bullocks were housed under the best conditions. The loose boxes were warm and comfortable and allowed only limited movement. This warmth and restriction probably contributed to a more efficient utilization of food than would have been the case had the bullocks been housed in open yards with unrestricted movement.

The writers wish to acknowledge the help given by the Chemical Research Division in the work of analysis, and to express their appreciation of the assistance and advice given by Mr. W. O. Brown, B.Sc., M.Agr., in connection with both feeding trials.

THE VALUE OF AUSTRALIAN SORGHUM FOR FATTENING PIGS

R. Braude and K. G. Mitchell
National Institute for Research in Dairying, University of Reading

SORGHUM is a cereal which requires warm weather throughout its growing season and consequently is grown mainly in tropical and sub-tropical countries. It is very resistant to drought and will produce a satisfactory yield when grown in very low rainfall areas where no other cereal would succeed. It is widely grown in many parts of the world such as South Africa, West Africa and the Sudan, where it forms the staple diet of a large number of the population. It was introduced to America some eighty years ago and is now grown on a very large scale in regions where the rainfall is insufficient for successful maize cultivation. There are many varieties of grain sorghums, and they differ from each other in such characteristics as yield, drought resistance and chemical composition. Another important difference is that in some varieties the glumes or husks are firmly attached to the grain and, as with the oat, these husks are not removed during threshing. In others, the husks are loosely attached and are easily removed from the grain when threshed.

There are vast stretches of semi-virgin land in Africa, Asia and Australia which are particularly suitable for growing sorghum. In 1948 the Overseas Food Corporation of Great Britain, realizing the great potentialities of the crop for augmenting the food resources of the world, started a big development plan in Australia, based on sorghum. Under this plan large acreages of sorghum are being grown in Queensland. Some of the grain will be fed to pigs in Australia, the bacon produced being shipped to Britain. A proportion of the sorghum will, however, be sent to this country to be used in the rations of our livestock; in fact small consignments have already arrived.

At the request of the Ministry of Agriculture an experiment was carried out to ascertain the value of the sorghum from Queensland and the extent to which it could be used as a substitute for maize and/or barley in the ration of the fattening pig. The effect of sorghum on the growth-rate, efficiency of food utilization and on the quality of the carcass was investigated.

Experimental Feeding to Pigs Twenty-four Large White weaners, about 11–12 weeks old, were selected from a number of litters and divided into six blocks of four pigs each. Each block consisted of litter-mates, and the blocks were balanced for sex (with one exception) and initial weight. Individual feeding was used throughout and a fortnight was allowed for the pigs to become accustomed to the experimental routine before the actual test was started.

Once weekly, pigs on all rations received 1 oz. of cod liver oil added directly to the trough.

Table 1 gives details of the four experimental rations, which were allocated at random to the four pigs in each of the blocks.

Table 1
Composition of the Four Experimental Rations
(per cent)

Ration	1 Control	2 30 per cent sorghum replacing barley meal	3 30 per cent sorghum replacing maize meal	4 60 per cent sorghum replacing barley meal and maize meal
Wheatfeed	30	30	30	30
Barley meal	30	—	30	—
Maize meal	30	30	—	—
Sorghum meal	—	30	30	60
Fishmeal	10	10	10	10

In Table 2, the chemical composition of the sorghum is given along with that of the maize and barley meal used in the experiment. These figures indicate that sorghum is more like maize in chemical composition than barley, the latter having an appreciably lower oil percentage and a higher fibre percentage than either sorghum or maize.

The small round sorghum grain used was approximately ⅛ inch in diameter, reddish-brown and pale cream in colour, with black markings and without husks. The grain was fairly coarsely ground in a hammer mill before being incorporated in the meal mixtures. The meal was weighed out and fed, twice daily, as a wet mash, 3 lb. of water being given for each pound of meal. The quantity of meal fed was based on live weight and a scale for fattening pigs.

The experimental period lasted for 18 weeks; the pigs were then slaughtered at the local bacon factory and the carcasses, and later, the sides of bacon, were examined and graded by experts. Samples of the bacon were also tasted by various panels of ordinary consumers to determine whether any unpleasant flavour was imparted to it by the sorghum.

Table 2
Chemical Composition of Sorghum, Maize and Barley
(per cent)

	Sorghum Meal	Maize Meal	Barley Meal
Moisture	12.0	13.6	15.3
Crude protein	10.2	9.4	9.3
Ether extract (oil)	3.3	4.3	1.5
Soluble carbohydrates	71.9	69.6	67.7
Fibre	1.2	1.7	4.1
Ash	1.4	1.4	2.1

Results *Growth and Efficiency of Food Utilization.* Table 3 gives the average results in respect of liveweight gain and efficiency of food utilization for the pigs on each of the four treatments. It is obvious from the figures that there were no appreciable differences between any of the treatments, and, when analysed statistically, all differences were found not significant.

Carcass Measurements and Grading. Carcass length, hind leg length, shoulder fat, loin fat, rump fat and streak measurements were made on all carcasses. There were no significant differences between the means of any

Table 3

Average Liveweight Gain and Meal Consumed per pound Liveweight Gain during the 18-week Experimental Period

Ration	Liveweight gain	Average gain per day	Meal Consumed per 1 lb. liveweight gain
	lb.	*lb.*	*lb.*
1. Control	181.8	1.44	3.6
2. 30 per cent sorghum replacing barley	183.4	1.46	3.5
3. 30 per cent sorghum replacing maize	177.3	1.41	3.7
4. 60 per cent sorghum replacing barley and maize	178.3	1.42	3.6

of the measurements, although the fat measurements of the pigs which received 60 per cent sorghum in the ration were all slightly lower than those of the pigs on the other treatments. The commercial grading showed that all carcasses could be classed as satisfactory and that there were no differences attributable to the different rations fed.

Quality of Fat. The iodine number of carcass fat is usually taken as an index of its quality. The bacon industry requires a hard fat with relatively low iodine numbers, and before the war the rather high standard set meant that the subcutaneous fats should have iodine numbers below 67. Softer fats were liable to be penalized.

Table 4

Mean Iodine Numbers of Subcutaneous Fats

Treatment	1 Control	2 30 per cent sorghum replacing barley	3 30 per cent sorghum replacing maize	4 60 per cent sorghum replacing maize and barley
Shoulder fat	74.62	77.63	76.04	78.26
Loin fat	74.35	76.13	74.61	76.65

From the figures given in Table 4, it is seen that by pre-war standards all the fats evidently fall into the range of soft fats. It should, however, be borne in mind that our control ration, as designed for the purposes of this experiment, contained, throughout the fattening period, maize and cod liver oil, both of which are liable to produce soft fats when used in this way.

As far as the effect of treatments is concerned, the statistical analysis of the data in Table 4 showed that when either sorghum alone or sorghum plus maize exceeded 30 per cent of the ration, the iodine numbers of both the shoulder and loin fats were significantly increased. Thus sorghum, similarly to maize, tends to produce a soft carcass fat when used in large amounts. This is not surprising when one considers the oil content of both sorghum and maize, and the high iodine numbers of this oil (averages of 114.5 and 126.0 respectively).

Quality of Cured Bacon. After the carcasses had been commercially cured and smoked, a number of measurements were made on them. Analysis of this data showed that the feeding of large amounts of sorghum tended to produce a slightly leaner pig when compared with the control carcasses.

Samples of the bacon were taken at the twelfth rib from one side of each of the experimental carcasses. After grilling separately, they were given to two panels of ordinary consumers, each person receiving four samples of bacon, one from each of the four treatments. Each sample was numbered, but the number gave no indication to the taster of the treatment with which the sample was associated. The tasters were asked to place the four samples in order of preference. Analysis of the results showed that there was no significant agreement in the order in which the samples were placed, and although the total number of tasters involved was rather small, there was no doubt that the bacon produced from pigs fed sorghum, even in large amounts, had no off-taste or unpleasant flavour of any kind.

Conclusions The results indicated that the rate of growth and the efficiency of food utilization of the pigs receiving sorghum in their ration were as good as those of pigs fed the control ration. The carcass and bacon quality investigations showed that the quality of the carcass fat suffered when either sorghum alone or sorghum plus maize formed 60 per cent of the ration. On the ration containing 30 per cent sorghum and no maize, the quality of the carcasses was satisfactory by present-day standards. When commercial grading is reintroduced, however, the effect of sorghum on carcass quality will have to be borne in mind.

A replicate of this experiment was carried out by K. L. Robinson at the Agricultural Research Station, Hillsborough, Northern Ireland. In general, the results obtained were in line with those reported here, except that they gave an indication that on the ration containing 60 per cent of sorghum, the growth-rate and efficiency of food utilization were slightly lowered.

To sum up, sorghum may be considered as a satisfactory cereal for inclusion in the ration of the fattening pig, with a value approximately equal to maize. As far as the amount is concerned, it is felt that 60 per cent of sorghum exceeded the optimum. This is in line with the usual recommendation for good fattening rations—that no one cereal should be included at more than 50 per cent of the ration.

A full report of the experiments carried out at both Reading and Hillsborough will be published shortly in the *Journal of Agricultural Science*.

AGRICULTURAL INDEX NUMBER

MONTHLY INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS INCLUDING GOVERNMENT GRANTS. (BASE 1927–29 = 100)

Month	Uncorrected for Seasonal Variation					*Corrected for Seasonal Variation*				
	1939	1947	1948	1949	1950	*1939*	*1947*	*1948*	*1949*	*1950*
January ..	96	217	242	245	264†	*89*	*193*	*215*	*218*	*235†*
February ..	94	211	240	243	258†	*88*	*190*	*217*	*219*	*232†*
March ..	90	201	232	237	248†	*91*	*191*	*220*	*225*	*234†*
April ..	90	186	214	227	234†	*95*	*192*	*222*	*237*	*244†*
May ..	82	171	198	208	213†	*91*	*192*	*223*	*235*	*242†*
June ..	80	170	198	207	211†	*89*	*193*	*225*	*236*	*242†*
July ..	85	181	197	209†		*93*	*197*	*215*	*233†*	
August ..	87	192	211	224†		*91*	*209*	*228*	*244†*	
September ..	93	206	210	224†		*93*	*223*	*227*	*242†*	
October ..	97	222	225	242†		*92*	*216*	*220*	*234†*	
November ..	107	235	239	257†		*98*	*217*	*222*	*235†*	
December ..	114	241	245	264†		*104*	*217*	*221*	*235†*	

† Provisional.

LEY FARMING ON A FYLDE FARM

R. HOPE, B.Sc., N.D.A.
Assistant County Agricultural Officer (Advisory), Lancashire

LARBRECK HALL FARM, covering 82 acres in a district largely devoted to dairy farming, is a notable example of high production achieved by the adoption of a ley farming system and the judicious use of fertilizers. Situated near Little Eccleston, in a well-farmed district of level land in the fertile plain of the Fylde of Lancashire, this farm was taken over by Mr. H. Armitstead as tenant in 1943. The farm, with the River Wyre running along one boundary, is laid out very conveniently and adequately equipped with buildings, including modern shippons. The soil is a clay loam derived from boulder clay, and over half the holding is a little too heavy for ideal working and is inclined to lie rather cold and wet. The high water table, on land only approximately 25 feet above sea level, coupled with the impervious nature of the soil and subsoil, is not conducive to good drainage. Nevertheless, although the land can be difficult to work, particularly after a mild and wet winter (which is often experienced in the district), Mr. Armitstead had in 1943 approximately half the area of the farm under an arable rotation, the remainder being permanent grass for hay and grazing. Some 50 head of dairy cattle (30 cows and their followers) were carried, and this represented fairly truly the stock-carrying capacity of the farm at that time.

Old Grass into New Dissatisfied with the production from the meadows and pastures on the holding, Mr. Armitstead decided to plough up some of the permanent grassland with a view to establishing more productive leys, and his first attempts were so encouraging that he continued to take the plough steadily round the farm. By 1948 only one small field of 3 acres remained in permanent grass, through which access to several other fields was obtained. The policy of replacing the permanent grass by productive new leys had been so successful that notwithstanding the matter of access to other fields, this small field was ploughed up and sown with kale in the spring of 1949.

At this stage the stock had increased to 90 head of dairy cattle (50 cows with 40 followers) and all the summer grazing and hay for winter was provided by the 44 acres of land under leys. Winter milk production, too, had shown a striking increase—from an average production of 50 gallons per day during the winter of 1943–44 to an average of 150 gallons per day for the winter months of 1948–49.

A comparison of the cropping of the farm in 1943 with that of 1949 is interesting :

1943		1949	
Permanent grass	36.8 acres	Permanent grass	Nil
One-year ley	14.9 acres	Leys	44.1
Oats	21.9 acres	Oats	22.6
Green crop	6.4 acres	Green crop	13.3
Stock	50 head of cattle	Stock	90 head of cattle
Daily winter milk production 1943–44 winter	50 gal. per day	Daily winter milk production 1948–49 winter	150 gal. per day

It will be seen that whereas 51.7 acres of grassland comprising 36.8 acres of permanent grass, with 14.9 acres of one-year seeds from the arable side of the farm provided hay and grazing for 50 head of cattle, 44.1 acres of the

new leys produce all the hay and grazing needed for 90 head. Although no records have been kept of the number of cow-days of grazing provided by the leys, it was observed in 1949, a season which due to abnormally dry weather was not the most suitable for grassland, that 35 cows were grazed from April 24 to July 11 on 16 acres of land divided into four small fields. The cows were then removed to fresh fields but still continued to use the 16 acres as "night pasture". It is not possible to carry out a precise system of rotational grazing, owing to the fact that water is not laid on to each field, but an "on-and-off" system of grazing management is practised to some extent, even though it entails the trouble of moving the cattle to water. With the high water table and in a district of fairly heavy rainfall, some difficulty has been experienced with poaching of the leys, and care has to be taken to avoid over-treading in wet weather. For this reason, the stock are not turned out to grass too early in the spring, following the normally mild and wet winters which are encountered in this district, as it has been found that the productivity of the ley falls off considerably after treading in a wet condition. Reconditioning of the drainage system in the wetter fields, however, has effected considerable improvement.

No fixed rotation is adhered to, but the leys sown with a general-purpose mixture, including a proportion of pedigree strains of grasses, are normally left down for three to four years and then ploughed out for a crop of oats, after which a green crop is taken, and finally another oat crop undersown with grass seeds. Occasionally a field may be directly seeded, but more generally the cereal crop is undersown. On the drier side of the farm a one-year seeds mixture is sometimes sown, but most of the leys are intended for three to four years' duration, although Mr. Armitstead does not hesitate to plough them up after a shorter period than this if the productivity appears to be falling off. The greencrop consists mainly of cabbages, with a few savoys and a small area of mangolds. The cabbage have proved excellent for milk production, less difficult to cut and cart in wet weather than kale, and usually last well into February—in some years into March. Three acres of kale for silage have been grown for feeding in the late winter period. This year Mr. Armitstead has decided to replace some of the greencrop area by grass silage from the leys with a view to economy of labour. Grass silage has not previously been made, but cuts of very high quality hay from young grass have been taken, and sometimes three hay crops are taken from a field in one season.

Heavy crops of oats have been obtained following the ploughed-out leys ; indeed they have sometimes been too heavy and have lodged. The S.84 variety of oats is favoured, as the straw of this variety is of very good feeding quality. With a view to increasing the protein content, a few beans are now sown with the oats. No cash crops are grown, the whole of the arable acreage being used for stock feed.

Fertilizers and F.Y.M. One of the most important factors in achieving high production on this farm has been the use of fertilizers. The entire area was limed as a basic treatment, and limed again after four years. The usual fertilizer practice is the annual application of 5 cwt. per acre of No. 1 Complete Fertilizer to the leys, followed by a top dressing of 4 cwt. per acre of a nitrogenous fertilizer in two 2 cwt. per acre applications. The green crop received 10 cwt. per acre of No. 1 Fertilizer, followed by 5 cwt. per acre of a nitrogenous fertilizer, these fertilizers being applied in addition to a very heavy application of farmyard manure. The stocking of the farm is heavy, even for a district where generally the stocking

is considerably above the average for the country, and as a result a great deal of farmyard manure is produced. Full use is made of it, heavy dressings being given not only to the green crop and the fields to be mown for hay, but also to the pasture land. No farmyard manure is applied to the cereal crop, however, and with a view to minimizing the risk of lodging, fertilizers are also withheld. A much better response to fertilizer treatment has been shown by the leys with their vigorous leafy strains of grasses than was previously obtained from the permanent grassland, and correspondingly better arable crops have been grown following the ploughed-out leys than were harvested when the arable land was confined to one area of the farm.

Winter Milk from Attested Ayrshires Milk production is, of course, the main enterprise on this farm, and an attested commercial herd of Ayrshire cows is kept. Mr. Armitstead is also grading up his herd and rearing the heifer calves for replacement. The result has been that the numbers of cattle have rapidly increased ; at the present time they total 135 head, including 50 cows, so that notwithstanding the improvement to the land, shortage of summer grazing has become a problem. On an average 18–20 acres are mown for hay, leaving little more acreage than this for grazing. Fortunately it has been possible to rent an additional 25 acres of land this year, but 14 acres of this were immediately ploughed with a view to improvement, so that some young stock have had to be sent away on agistment for the summer months.

Emphasis has been placed on winter milk production, and Mr. Armitstead has been very successful in getting the cows to calve down in the autumn. He attributes his success in this respect in no small measure to the effect of a comparatively large acreage of cabbage in the winter, and it is confidently expected that the replacement of some of the greencrop area by grass silage will enable him to ensure that no difficulty will be experienced in obtaining optimum calving dates in the future. His skill in winter feeding the dairy herd is shown by the fact that production from the 48 cows in milk last winter approached 200 gallons per day and on some occasions exceeded this figure, notwithstanding that the milk fed to the 28 calves on the holding was not included in the total. On turning out to grass in the spring, the usual increase in yields is not experienced, a fact which indicates the correctness of the winter rationing. Cows giving up to 4 gallons per ay receive about 9 lb. of hay, 3 lb. of oat straw, 35 lb. of cabbage and are then fed 3½ lb. of concentrates for each gallon after the first. No straw is fed to the higher yielding cows.

Milking is done twice daily only, but the importance of even intervals between milkings is held to justify the long working days involved. Hand stripping is no longer practised, and since its discontinuance there has been less udder troubles. Official milk recording is not carried out, but yields are recorded once every week by Mr. Armitstead for his own information and have proved of value for rationing purposes.

The whole of the work on the farm is carried out with remarkable economy of labour ; the permanent staff consists of the farmer, his son and one male farm worker. Some casual labour is employed at the busiest periods but this does not amount to very much. Full use is made of mechanization ; two tractors are in use, one of which has the hydraulic lift with the accompanying implements. Until recently one horse was kept, but Mr. Armitstead now depends entirely on the tractors. Great attention is paid to the maintenance of the tractors and implements, and loss of time due to breakdowns is rare.

LEY FARMING ON A FYLDE FARM

While milk production is by far the most important part of this farm's economy, it is rare to find a Fylde farm where poultry do not play some part, and at Larbreck Hall some 400 birds are kept for commercial egg production. These birds were formerly on open range, but now a modern battery has been installed, with a view to more efficient production and the saving of labour. Mr. Armitstead estimates that the new system has resulted in a nearly 50 per cent increase in egg production.

A further enterprise is the breeding of pedigree Large Black pigs. At the present time 24 breeding gilts and sows are kept.

Mr. Armitstead's achievement in raising the productivity of his holding to the present high level has received recognition in the form of the award of 1st Prize in 1949 for the best managed farm in the medium-acreage class of the Blackpool Dairy Farmers' Association's competition.

WEED CONTROL BY GOOD HUSBANDRY

S. J. TRAVERS, N.D.A.

National Agricultural Advisory Service, E. Midland Province

FARMING involves unremitting war on weeds. There are general strategic principles and minor tactical moves in the struggle, and together these form a very important part of the art of husbandry. The prevention or suppression of weeds also improves fertility, by avoiding waste of moisture and plant foods. Although the chemical control of weeds is rapidly becoming a science, weed control as a whole is not, but is rather a combination of several actions. Some of these, which include cultivations, should be taken regularly as a part of good farming practice, while others can be held in reserve until called for by the really severe infestation of particular weeds.

In spite of many efficient chemical herbicides, prevention, rather than cure, should always be the conscious aim. By careful thought and timing, normal cultivation can often act as a preventive, thus saving the cost of chemical treatment. Failing this, chemical treatment can still be the strategic reserve.

The Importance of Rotations Crop rotations play a very important part in weed control. A rotation helps to keep the land clean by ensuring that crops of different habits (such as cleaning and smothering crops, and fallows or their modern counterpart) appear periodically on all arable fields of the farm, and the fundamental traditional principles should always be kept in mind. If one crop were to be grown continuously on the same piece of land, at least one species of weed would be favoured by the time and type of cultivations used, and, spreading rapidly, would dominate the crop. The Broadbalk wheat field at Rothamsted, where a section has now to be fallowed every year on account of the weed problem, is a classic example of this.

Two increasingly serious weeds, wild oat (*Avena fatua*) and black grass or slender foxtail (*Alopecurus agrestis*), the latter usually on heavier land, have been favoured by the war-time emphasis on wheat and winter corn generally, which has compelled a departure from traditional cropping sequence and has tended to standardize the type and time of cultivation. These are annual weeds which ripen and shed their seed in June and July

before the corn is cut. The seed of black grass and some of the seed of wild oat will germinate from October to December. Thus, with winter corn, the seedbed is prepared at the best times for these weeds also. In addition, as stubble cleaning is nowadays often missed, except in very favourable weather, and because of the speed with which modern implements prepare the land for drilling in spring, the weeds escape destruction during the vulnerable period of their life cycle, namely, as autumn and spring seedlings.

Control of these weeds, and also of corn buttercup (*Ranunculus arvensis*) and shepherd's needle (*Scandex Pecten veneris*), might take the form of ploughing and preparing the autumn seedbed—perhaps rather finer than for winter wheat—but deferring drilling the cereal crop until the spring. The black grass and, to some extent, the wild oats and other weeds, will germinate and the land can be cultivated in October, drag-harrowed early and late in November, and subsequently ploughed when soil conditions permit. Corn buttercups and shepherd's needle will probably necessitate working the land after Christmas as well.

It must be emphasized that sound crop sequence is a fundamental means of weed control, and the different methods and times of cultivations required by different crops are very important factors in weed control generally.

The wild oat presents a special problem in its persistency, and as with charlock (*Sinapis arvensis*), it can build up in successive corn crops a large potential of buried viable seeds. Moreover, it cannot be induced to germinate in mass by any known means. At present, there is no chemical which can be used as a practical proposition to control wild oats. Even should a chemical control be introduced, there will still be the major problem of the dormant seeds, without which line of resistance the wild oat would be little more troublesome than self-sown cultivated oats.

At present, control of wild oats consists of :

Prevention by hand pulling and burning of pioneer wild oats in otherwise clean fields ; by the use of uncontaminated seed ; by burning contaminated threshing residues; and by grinding thoroughly any screenings containing wild oats before feeding.

Eradication by giving special attention to the cultivation and cropping of infested fields on the following lines :

1. Autumn stubble working, followed by cultivating or ploughing in of any seedlings ; avoidance of autumn- or early spring-sown corn.
2. Potatoes. The deep ploughing will bring up buried seed, and ridging, splitting, harrowing, cultivating and earthing-up will destroy successions of seedlings. Late-comers should be hand-pulled.
3. Early potatoes or a silage crop, followed by a bastard fallow.
4. Two root- or row-crops such as peas or beans.
5. When reintroducing cereals, the safest would be winter oats, since their earlier harvesting usually allows the crop to be carried before any appreciable quantity of wild oat seed has been shed. The resulting grain crop should be used entirely for feeding. Two crops of winter oats in succession, followed by a green crop or other row crop, would give a considerable degree of control.

Deep ploughing and sowing to a ley only buries the seed, which remains dormant until the land is ploughed again.

Modern tractor power enables the soil to be worked very thoroughly at the crucial times in the weeds' life cycle, and it is possible to keep the land reasonably free, even though corn is taken more frequently than in the days of more rigid rotations. Bold experiments are being made in cropping

sequences by progressive farmers, and it cannot be denied that many have been successful when cropping purely with an eye to profit, using to the full the results of modern research. At the same time, weaknesses in a cropping system show only slowly, and we should not disregard principles which have been evolved by centuries of experience.

How Cultivations Assist in Controlling Weeds The publication of *Ploughman's Folly* popularized a general reaction against an old tradition that treated good cultivation almost as an end in itself. It has been shown that although many of the late cultivations for root crops are unnecessary, early cultivations are particularly important when the crop and the weeds are young and small. Once the primary function of cultivation is recognized as the control of weeds, many old questions about the method, time and depth of cultivation can be seen in better perspective.

Moving the soil, as in cultivation, is a powerful means of weed control, its efficiency varying with the different weed species, and, of course, with the weather. In unsuitable, wet conditions, moving the land does more harm than good, and most of the weeds, even annuals, quickly re-establish themselves.

In most conditions, the plough provides one of the best ways of controlling weeds. The outstanding result of Dr. Russell's deep ploughing experiments has been the reduction of the weed population. Good ploughing not only cuts the weeds but also buries them ; it completely exterminates all annuals and weeds with surface runners, e.g., silverweed (*Potentilla anserina*) and creeping buttercup. Even if perennial weeds such as docks and thistles survive, they are weakened and, if the plough can be used often enough and at the right time, they will eventually be killed.

The practicability of destroying weeds which have underground stolons depends largely upon the depth at which they run. Thus, water-grass (*Agrostis stolonifera alba*) usually runs at about 2 to 3 inches, and couch grass (*Agropyron repens*) at 3 to 4 inches deep, well within plough depth. The stolons of creeping thistle (*Cirsium arvense*) are usually deeper, and it may be necessary to plough deeper than usual to reach them. Those of the bindweeds and coltsfoot are generally beyond reach of the plough.

Harrows, both heavy and light, cultivators and discs, each used intelligently and skilfully and, above all, at the right time, can be highly efficient implements for controlling weeds.

The main purpose of hoeing is weed destruction, especially of annuals, which are vulnerable to cutting through the hypocotyl or upper part of their roots, but perennials, such as creeping thistle, and docks, if not killed, can at least be weakened, saving much future trouble. Although root crops are commonly called cleaning crops, they are not necessarily so, because wide rows give weeds great opportunity and seedling "roots" do not compete well with weeds. Nevertheless vast numbers of weeds are killed if full opportunity for hoeing is taken before the crop makes any headway. The date of sowing a root crop, if not too early, can, in the preparation of the seedbed, contribute greatly to weed destruction. The practice of "chop hoeing" special weeds in corn crops, mostly thistles, could well be more widely practised ; a light infestation of such weeds hardly warrants the expense of chemical spraying in any case.

It is a truism that the best way to keep down weeds is to grow full crops. The master farmer, well up with his work and liberal with manure, reaps his reward in the ease with which he keeps his land clean, as well as in heavy yields. Crops vary in their power of smothering ; silage mixtures, rape,

kale, sugar beet, mangolds, oats and full wheat crops, kept clean in their early stages, are most effective smothering crops.

A change of cropping, under which an established weed species may find its conditions completely altered, can be a most effective form of control ; for instance, as few weed species thrive under both sets of conditions, a change from arable cropping to ley, or vice versa, gives excellent results. There is no finer method of controlling annual weeds on arable land than a spell under a well-managed ley, when most of the weed seeds die out. Even couch can be killed on some soils by sowing to grasses and white clover, provided the grazing management ensures firm conditions and heavy grazing. Such weeds as corn marigold (*Chrysanthemum segetum*), mayweed, spurrey (*Spergula arvensis*) and sheep's sorrel (*Rumex acetosella*), may eventually be eliminated by liming, but not necessarily all in one season. The presence of coltsfoot (*Tussilago*) suggests a wet clay subsoil, and adequate drainage may assist in its control.

Prevention of Seed Dispersal One per cent of weed seeds in a million crop seeds means sowing weeds at the rate of 2 per square yard. In addition, weed seeds may reach the land in large quantities in dung, sweepings from unburied threshing refuse, and from untrimmed hedgerows and farm roads.

Generally speaking, conditions favouring the establishment of crop plants also favour the germination of weed seeds, but there are exceptions. The ideal autumn wheat tilth is a little rough for black grass and poppy (*Papaver* sp.), so that heavier infestations of these may occur when the seedbed has been made rather too fine to be ideal for the wheat. Charlock tends to be more abundant when spring frosts have produced very fine natural tilths. All annual weed seeds freely establish themselves in the ideal seedbed for roots, grass and clover seeds. A traditional method of killing seedlings is to prepare a tilth, such as for barley, and then to wait until weed seedlings have germinated, before drilling the crop and giving the final harrowing. The best kill may usually be obtained before the actual emergence of the weed seedlings, when, on scraping aside the soil with the boot, large numbers of silvery thread-like shoots are seen. It is a matter for careful consideration whether, say, a fortnight's delay in drilling is worth the expected kill of weeds ; each case must be treated on its merits. As carrots, sugar beet, and some herbage seed crops are slower to emerge than most of the common weeds, the inclusion of some mustard seed enables the rows to be seen early, with a view to hoeing.

Much can be done to control annual weeds by the judicious cross-harrowing of some crops, particularly winter wheat and rye, and peas and beans before they become brittle. Although experiments have failed to show many cases of significant benefit by traditional harrowing and rolling of winter wheat, whenever there is considerable annual weed infestation, by, say, chickweed (*Stellaria media*), poppy or speedwell (*Veronica* sp.), harrowing can be most effective, provided it is done when the weed seedlings are most vulnerable, i.e., when their food reserves are almost exhausted and their roots barely established. With spring-sown cereals, harrowing is best done when the crop has a good root hold, and even then, the land and the crop should be inspected after each stroke of the harrows and the work stopped as soon as the desired result has been obtained, or if damage to the crop is suspected. Spring oats do not stand up to harrowing well.

The ring-roll can be very efficient in killing young seedling weeds, by causing bruising, compression, and side movement, especially if the tilth is a little knobbly. Also, mature chickweed in young crops of timothy and

cocksfoot for seed has been reduced effectively by bruising following repeated ring-rolling, and by harrowing.

The harrowing of potato ridges, some three weeks after planting, has as its main object the killing of seedling weeds ; masses of weeds growing on the tops of the ridges may be destroyed, thereby postponing and lightening hand-hoeing. The saddleback harrow is ideal, as it covers and moves more of the outside of the ridges, whilst the tines do not go so deeply into the tops of the ridges as with ordinary seed harrows. Such harrowing, if followed by inter-row cultivations, repeated two or three times, usually gives a good control of weeds.

To kill the weeds between the plants on the ridges, the crop may be hand-hoed once, but if the ridges have been harrowed, this can usually be deferred until more urgent work has been completed. The final ridging up in July or early August is in itself a valuable cleaning operation.

Special Cleaning Methods There are several special cleaning methods, namely, stubble cleaning, autumn and spring cleaning, and fallowing. The principle of stubble cleaning is to break the top few inches of the soil immediately after harvest, thus causing the weed seeds shed before or during harvest to germinate. Ideally, stubbles should be broken between the rows of stooks where the binder has been used. Later in autumn, after an interval for germination, the seedlings are ploughed in. With the reduced amount of cultivation and less hoeing characteristic of present conditions of corn growing, stubble cleaning should be done more generally than it is. Shed grain, which gives rise to "rogues" in a succeeding cereal crop for seed, is also dealt with effectively. The old-fashioned Kentish broadshare—a wooden gallows plough carrying one share—was designed for this purpose. Requiring two horses, and covering a width of eighteen inches, it did really excellent work. Almost equally good results can be obtained, in reasonably moist soil, by a tractor-drawn cultivator with wide-cutting shares. If the land is dry and hard, a discing, repeated if necessary, will suffice. Much depends on the weather. In a dry time, established weeds will also be killed, though that is a secondary effect. The main purpose is to encourage annual weeds to germinate, and this can be done most effectively if the weather breaks in September. Experiments have shown that normal ploughing in November and December will kill 100 per cent of the annual weed seedlings produced. If stubble cleaning operations can be carried out in September, some seeds will germinate as soon as rain falls ; some will lie dormant until October or November, and others until spring. If ploughing can be left until late November and December, good results may be expected, especially if two germinations followed by harrowings can be achieved. Weeds which have no dormant period, e.g., chickweed, shepherd's purse (*Capsella*), groundsel (*Senecio vulgaris*), annual meadow grass (*Poa annua*) and cereals, will be killed. Cleavers or hariff (*Galium aparine*), speedwell, some wild oats, black grass, poppy and some charlock may be induced to germinate with a light harrowing in October, and will then be killed if ploughing can be deferred until late November.

Many weeds with a definite dormant period, including knotgrass (*Polygonum aviculare*), black bindweed (*Polygonum convolvulus*) and fat-hen (*Chenopodium album*), which germinate in winter or spring, will not respond to stubble cleaning in its usual sense. They need the working of the land in spring, such as before a corn crop, a thorough hoeing in root crops, or possibly a turn of the land under ley.

The autumn cleaning of heavy land is often termed "stubble cleaning," but it is quite a different thing. With couch and watergrass, those common perennial weeds of arable land, the aim is to drag them clear of the soil and burn them without, if possible, breaking up the rhizomes or underground parts. On heavy land, it is only at the end of a dry summer that success can be achieved, and in such a season the alert farmer seizes the opportunity immediately after harvest, and thus obviates the need for a full fallow.

The underlying principles involve: separating a layer of top soil, by ploughing no deeper than 4 or 5 inches, so that no severed pieces of root can be seen at the bottom of the furrow ; breaking the furrow slice by a cultivator drag-harrow across the furrow (sometimes a roll may be effective) ; separating the rubbish, by drag-harrowing or with a cultivator if necessary ; collecting the rubbish, usually by light harrow—probably this is the only case where a plain chain-harrow can be effective ; burning or carting off ; if necessary, giving another turn of the cultivator, followed by collecting and burning, to complete the job. If only parts of a field are foul with these weeds, the cleaning can be restricted to those parts.

On light land perennial rubbish can be shaken out in most seasons, and "spring cleaning" is probably most commonly done in April, before a root crop, following the initial winter ploughing. In this case the cleaning operations, once started, should be pushed on rapidly to avoid loss of soil moisture. It is most necessary to avoid this loss of moisture in spring, and it is, therefore, much better for the cleaning work to be done in autumn, if the pressure of other work permits.

In Nottinghamshire, on the Bunter sand, really heavy infestations of couch are successfully overcome by bringing the rhizomes to the surface, cutting them up thoroughly by repeated discing—a procedure entirely contrary to the usual practice of the country—and ploughing them in deeply and well with a digger plough. Some of these lightland farmers regard the clearing and burning of couch to be a wanton waste of good potential organic matter, of which such land can never have too much. The results in cleanliness and fertility of this method of cleaning sand land have to be seen to be believed. In Kent, William Alexander was successfully practising this method on the chalk many years ago.

A further cleaning process on heavy land is the bare fallow. This is sometimes wrongly called the "winter fallow," for on heavy land it is the months of June to August that must usually be relied upon. The principle is well known and involves the killing of weeds such as couch, watergrass, docks and thistles *in the clod*, by leaving the land in rough condition during the summer. The clods dry out, and the weeds, rooted in the clod, are shrivelled. Normally, the field is left unploughed till April, and is then ploughed full depth, preferably when on the wet side. A month or so later it is cross-ploughed (or steam cultivated), undercutting all the weeds again. The object is to get the field so rough that it is difficult to walk across it. Thereafter the clods are stirred in hot, dry weather, to get them completely dried out. The field is ploughed just before or after the time of the corn harvest, preferably afterwards. This ploughing will then bury any annual weeds which may have appeared in the tilth, and it will bring up some clod, thereby avoiding too fine a tilth for autumn sowing.

Taken after seeds, silage or arable hay crops, the effectiveness of a bastard or "Pen" fallow, may be high, but, as with the bare fallow, everything depends on the weather. No new principle is involved, but the operations of the bare fallow are telescoped. It has the great advantages of not wasting a whole year of cropping, and of not giving such a fine tilth. On the other

hand, the bare fallow gives the better chance for killing the perennials, because a dry time at any part of summer will suffice, not only during the latter half.

Weed control by cultivations, to be really effective and economical, demands the intelligent use and timing of every implement appropriate to the weed which is causing trouble. This means that every operation should fit the weed concerned, and should not be carried out just because it is customary.

THE CONTROL OF HOARY PEPPERWORT ON LIGHT SOILS

S. J. Willis, B.Sc. (Agric.)

Hertfordshire Institute of Agriculture, St. Albans

An article describing earlier trials for the control of hoary pepperwort in Hertfordshire appeared in the September, 1949, issue of *Agriculture*.

Since its presence was first recorded in this country in the early nineteenth century, hoary pepperwort has had a spectacular history. It spread rapidly over south-east England and in many places has been recognized as an important weed for over thirty years, but its control has been difficult because of the extensive creeping root system which it produces. Early attempts at chemical control have been described in this Journal by Robson(1), Garrad(2) and Gardner(3); cultural control methods, besides being of doubtful efficacy, are tedious and difficult. With the advent of the hormone type of weed-killer, however, the problem has aroused fresh interest, and already Professor G. E. Blackman(4) has described methods of controlling pepperwort with these materials on heavy land.

In Hertfordshire many of the pepperwort infestations are on light and medium soils, and a method of control was sought whereby the good effects of thorough spring cultivation could be combined with those of the weed-killers. The evidence available from previous experiments suggested that a few years of spring cereal cropping, with a dressing of the weed-killer applied each year, should give a satisfactory control. In 1948, therefore, an experiment was begun on a badly infested field at Lemsford (already mentioned and illustrated in (3)) to investigate the possibilities of such a technique. The experimental plots were arranged in duplicate in the form of randomized blocks, and the treatments used were 2 lb. per acre and 4 lb. per acre of MCPA, applied both as dust and spray. This experiment is now in its third year, and it is felt that the results so far obtained are of sufficient interest to merit publication.

Spraying is More Effective than Dusting

The first applications of the weed-killers containing MCPA were made on April 12, 1948, in warm, sunny conditions when the pepperwort plants were in bud and standing 9–10 inches high. The crop was winter wheat; spring cropping was not adopted until 1949. Except for a few plants on the plots receiving 2 lb. per acre of MCPA dust, none flowered on the treated plots, and by May 17 when the pepperwort on the rest of the field was in full flower, all the treated plots showed a complete control. In 1949, the year after application, counts were made of pepperwort plants on the

plots and the results (expressed as plants per square yard) are given in Table 1.

Table 1

Plants per Square Yard One Year after Application of Weed-killer

Treatments 1948	2 lb. per acre* as dust		4 lb. per acre as dust	2 lb. per acre as spray	4 lb. per acre as spray	Control
Block A	13	18	9	3	2	36
Block B	24	16	11	0†	1	50
Average	18.5	17	10	1.5	1.5	43
	17.75					
Percentage Control	59		77	96	96	

Effect of sprays (not dusts) statistically significant (1 per cent point or better).
Sprays significantly superior to dusts (1 per cent point).

* Two plots in each block were given this treatment in case a second dressing was thought worth while; in actual fact this was never done.

† Some plants were present in this plot, although too few to be recorded by the counting technique employed.

It will be seen that the dusts were not as effective as the sprays but that, of the dust treatments, 4 lb. per acre of MCPA gave a better control than 2 lb. The two spray dressings were equally effective, both giving a 96 per cent control.

On May 13, 1949, when most of the pepperwort was beginning to flower, each plot was subdivided and the treatments repeated on one half selected at random. Counts made in 1950 on each half of the sub-divided plots have furnished information of two types : firstly, the plots re-treated in 1949 show the state of the pepperwort populations after two years of the suggested treatment, and secondly, those untreated in 1949 indicate the extent to which the weed has re-established itself two years after single initial treatment. The counts, expressed as plants per square yard, on the plots re-treated in 1949 are given in Table 2.

Table 2

Plants per Square Yard on Plots Re-dressed in 1949

Treatments 1948 and 1949	2 lb. per acre as dust		4 lb. per acre as dust	2 lb. per acre as spray	4 lb. per acre as spray	Control
Block A	9	24	8	3	1	46
Block B	15	6	8	4	1	66
Average	12	15	8	3.5	1	56
	13.5					
Percentage Control	76		86	94	98	

All treatment effects are significant (5 per cent point or better).
Sprays significantly superior to dusts (1 per cent point).

From Table 2 the same general conclusions can be drawn as from Table 1 but, in addition, the figures show that while the second dressing has given a marked increase in percentage control on the dust-treated plots, the position on the sprayed plots is unaltered. It is also important to notice that even after two years of treatment, the control is still not quite 100 per cent. Table 3 gives the counts of pepperwort plants (as numbers of plants per square yard) made in 1950 on the half-plots which were *not* treated in 1949.

Table 3

Plants per Square Yard on Plots not Re-dressed in 1949

Treatments 1948	2 lb. per acre as dust		4 lb. per acre as dust	2 lb. per acre as spray	4 lb. per acre as spray	Control
Block A	37	38	19	15	8	46
Block B	43	25	24	2	10	66
Average	40	29	21.5	8.5	9	56
	34.5					
Percentage Control	39		62	85	84	

Comparison between these figures and those in Table 1 shows there has been considerable recovery in the pepperwort population since the counts were made in 1949. At the same time, it must be remembered that within the experiment, owing to the presence of control plots and the surrounding area of untreated crop, the conditions for re-establishment are more favourable than they would be where a whole field had been treated. Despite this, however, the results in Table 3 do suggest that re-establishment of hoary pepperwort is likely to be rapid unless a high measure of control is obtained before stopping treatment. The difference in 1950 between the plots treated in 1948 only, and those treated in both 1948 and 1949 (compare Tables 2 and 3) is highly significant (better than 1 per cent) and shows the value of continuing treatment in successive years.

An experiment to compare the use of MCPA and the ethyl ester of 2-4D, and also to investigate the application of both these materials each at a rate of 1 and 2 lb. per acre, was begun on another site in 1949. Although no precise information is yet available on the results of this experiment, general observations suggest that the 2-4D preparation is as effective as MCPA and that low *spray* rates, particularly of 2-4D, might be effective. Observations have also suggested, however, that 2-4D in this form causes more damage to spring corn and, therefore, it might still be advantageous to use MCPA.

Effect of Cutting On April 24, 1948, four plots were added at the side of the main experiment with a view to obtaining some indication of the effect on the pepperwort of cutting by mechanical means. The four plots included one (A) on which the pepperwort was cut back with a scythe to within an inch or two of the ground, another (B) scythed and sprayed with 2 lb. per acre of MCPA and two controls (C1, C2). Even in 1948, the pepperwort on A showed considerable recovery, and in 1949 counts showed that the plot was as bad as either of the controls. Plot B

was no better than the 2 lb. spray treatment without cutting. The counts, in plants per square yard, from these plots were A4.4.6, B4.0, C1. 37.4, C2. 42.3. In 1950 the position was obviously very much the same and no further counts were made.

It seems then that the following conclusions can safely be drawn :

1. That on soils suitable for spring cultivation, control of hoary pepperwort can be achieved by treating a succession of spring cereal crops with MCPA.
2. That spray treatments are more effective than dusts.
3. That the treatment should be continued for at least three years, particularly where dusts are used.
4. That nothing is to be gained by using more than 2 lb. per acre of MCPA when applied as a spray.
5. That it is doubtful whether the extra control, not statistically significant in any year, gained by using 4 lb. per acre of MCPA in the dust form, as compared with 2 lb. would justify the extra cost. This cost would be more productive by repeating the lighter dressing over a longer period of years.

References

1. Control of the Weeds, Whitlow, Pepperwort, and Black Mustard. ROBSON, R. *Jour. Min. Agric.*, 1920, **26**, 56–63.
2. Hoary Pepperwort or Thanet Weed. GARRAD, G. H. *Jour. Min. Agric.*, 1923, **30**, 158–62.
3. Hoary Pepperwort in Hertfordshire. GARDNER, H. W. *Agriculture*, 1949, **56**, 272–5.
4. The Control of Hoary Pepperwort. BLACKMAN, G. E. and HOLLY, K. *Agriculture*, 1949, **56**, 6–11.

MANX AGRICULTURE SINCE THE WAR

G. WYLLIE HOWIE, B.Sc. (AGRIC.)
Isle of Man Board of Agriculture and Fisheries

TWICE, within seven years, the Isle of Man has been compelled to make a quick change in its agricultural objective to meet suddenly altered circumstances. The outbreak of war in 1939 meant, initially, the closing down of the Island's tourist industry ; it meant, also, that the organization of the output of farm produce, designed, as it was, primarily to meet the needs of a greatly augmented population during the summer months, was thrown seriously out of gear. It involved, too, considerable loss, because, while crops and cropping can be varied comparatively quickly, livestock present a more difficult problem. Alterations in calving and lambing dates in relation to marketing requirements cannot be achieved with anything approaching the same rapidity.

An account has previously been given in this JOURNAL* of the Island's war-time food production problems. It is sufficient recapitulation to say that it entailed a complete reorientation of farming policy ; that it became essential to plan, not for a high consumer demand during a short summer season, but for a relatively stable and considerably increased demand throughout the year ; and that, apart from the general need for maximum

* May, 1945, **52**, 49-53.

food production, the output of livestock products, particularly milk, beef, mutton, eggs and poultry, assumed important proportions.

1945 Cropping and Livestock At the end of the war the proportion of land under the plough, which, in 1939 was 70 per cent of the total acreage, excluding rough grazings, had been stepped up to 81.75 per cent—and that despite the fact that, as elsewhere in the British Isles, several hundreds of acres of the most valuable agricultural land had been converted into aerodromes or requisitioned for other defence purposes. The increase was achieved, not unexpectedly, at the expense of the permanent pasture ; rough grazings varied very little between 1939 and 1945. On the other hand, certain classes of livestock decreased substantially in numbers. Breeding ewes in 1945 showed a reduction of 20 per cent, compared with the 1939 flock, and, in the same period, the pig population dropped by over 25 per cent. The feedingstuffs shortage affected poultry-keepers severely : the number of fowls in 1945 was 10 per cent less than the pre-war figures. Horses, too, showed an alarming decrease of 24 per cent, but there was a compensating and astonishing increase in the number of tractors. Cattle, however, increased. The number of cows in calf and in milk and the number of heifers in calf increased steadily, until, by 1945, they were 22 per cent above the 1939 figures, while the total cattle population was 19 per cent higher than six years previously.

For many years oats has been the Island's principal corn crop. The climate and, apart from a few exceptional and small areas, the soil do not favour wheat and barley. During the war years, the acreage under oats remained practically constant, but there were substantial increases in the areas sown to wheat and barley. In 1939 only 122 acres were under wheat, but in 1944 there were 3,557 acres. In 1945 wheat dropped to a mere 676 acres, but there was a large increase, due in part to the shortage of protein-rich feedingstuffs and partly to the encouragement of an acreage subsidy, in the area under mixed corn.

The potato crop reached its peak in 1944, when the acreage was not far short of double that of 1939. By 1945, however, it showed a reduction, and was only 78 per cent above the pre-war break. The acreage of green crops for stock-feeding varied little during the war. The proportion of turnips and swedes tended to decline, but there was a corresponding increase in the area sown with rape, cabbages and kale.

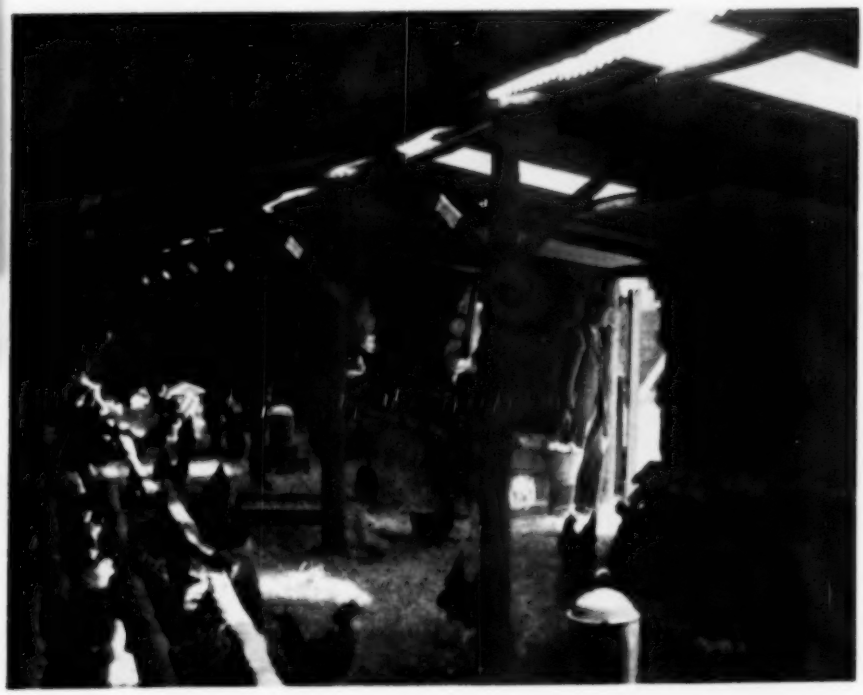
Post-War Reorganization When the war ended plans were immediately made to revive the Island's tourist industry. Not unnaturally, Manx farmers were expected to play their part by providing as much home-grown food as possible, particularly milk, lamb, beef, eggs and poultry, potatoes and vegetables, to meet the needs of the crowds of welcome holidaymakers who, it was hoped, would be visiting the Island in the short season from June to September. Food rationing remained in force, and is still with us, although, throughout the war, the Island was fortunate in being able to avoid having to ration milk, eggs and potatoes. The problem, as elsewhere, was not only one of obtaining maximum food production, but of reorganizing, as quickly as possible, the output of produce to meet a huge seasonal demand.

Certain factors, by no means peculiar to the Island, tended not to maintain production but actually to depress it. The most important was the withdrawal of part of the war-time labour force. Prisoners of war and internees disappeared, and, in due course, the Women's Land Army dwindled to a mere handful. It is gratifying, however, to be able to record that the number

One of the illustrations from Canon Stenning's book *The Isle of Man* reviewed on pages 206-7)

Peel, Isle of Man. The surrounding countryside shows the mixed cropping (oats, roots, potatoes and grass) typical of Manx farming

Exterior of straw yard constructed largely of bales



Laying and roosting section of straw yard

A semi-derelict building before conversion to an intensive poultry house

The same building – cheaply and easily adapted for laying hens

Town Democrat, a Hereford exhibited by Messrs. Burrows Bros.
at the Manx Spring Bull Show

Photo: *J. N. Panes*

The parade of bulls. The two white bulls were bred by the Manx Board of Agriculture

of regular workers on farms has remained steady during the past six years. There has also been a further increase in the number of tractors on farms, and a general movement towards mechanization of all kinds. In 1939 there were only 144 tractors on the Island ; in 1949 they numbered 701. A Tractor Contract Work Scheme, operated (at a loss) by the Board of Agriculture and Fisheries as a war-time measure, was gradually reduced in size, and finally closed down in November, 1949. Again, increases in farm wages and the rising costs of equipment and raw materials contributed towards a reduction in the area of land under the plough. It is still, however, obligatory for every occupier of land to " cultivate and maintain in cultivation not less than 50 per cent of his arable land".

The main problem in reorganizing the output of farm produce concerned livestock and livestock products, rather than crops. The cereal acreage has been practically unaffected, except that oats, wheat and barley all show reduced acreages (wheat markedly so), while land under mixed corn has increased considerably.

The biggest change has been in potatoes. Five hundred acres less (22 per cent) were grown in 1949 than in 1945, but first earlies, which in 1945 occupied 16 per cent of the break, were raised to 25 per cent in 1949. The area under market-garden produce increased by some 12½ per cent in the same five years, and there has been a marked expansion in the glasshouse section of the industry.

Livestock Encouragement to farmers to provide livestock and livestock products to meet the needs of the tourist industry was given, principally, in the prices fixed for their commodities. In general, average prices for milk and fat stock have borne some resemblance to those paid in England and Wales. The periods of peak prices have not, however, always corresponded exactly with the English scales.

Deliberate adjustments have been made in prices which, while leaving the yearly averages unaltered, gave higher prices at those periods of the year when supplies were most needed. The demand for milk, for example, is exceptionally heavy in July and August. The wholesale prices for these two months have, accordingly, been increased at the expense of those for other months of the year. Only in special circumstances have additional prices been given. It was done with fat cattle (steers and maiden heifers) to safeguard the Island's meat ration, and, to a limited extent, in the interests of the tourist industry, with fat lambs. For one or two seasons since the war, a special additional price, operating for a restricted period, was given to induce early marketing, and another method adopted was to make a price discrimination during July, August and September in favour of fat lambs weighing not more than 112 lb. live weight.

The effect of these expedients on the sale of fat lambs is shown below. The total number of lambs marketed in each of the calendar years 1946 to 1949, and the numbers marketed during the months of May to September, inclusive, in each year were :

Year	Total Lambs Sold	Lambs Sold May-September	
		Number	Proportion of Total *per cent*
1946	26,476	14,496	54.7
1947	21,144	10,897	51.5
1948	22,894	13,254	57.9
1949	24,713	14,278	57.8

After the war there was a tendency for the size of the breeding flock to increase, but severe snowstorms in the early part of 1947 caused a heavy mortality among ewes and checked the rise in numbers. The flock showed a partial recovery by 1949, but even then there were 1,000 ewes fewer than in 1945, and nearly 11,000 less than in 1939.

With fat cattle, while there were slight variations in the periods from one year to another, the price emphasis was placed on animals sold in, approximately, the months January to May, inclusive, and the first week in June. Sales of fat steers and heifers during the year and during the period mentioned were as follows :

Year	Total Animals Sold	Animals Sold January-May	
		Number	Proportion of Total *per cent*
1946	4,096	1,530	37.4
1947	3,744	1,150	30.7
1948	3,553	1,802	50.7
1949	4,089	1,909	46.7

The breeding herd continued its upward trend. By 1949, cows in milk or in calf and heifers in calf had increased by 4.5 per cent on the 1945 figure, and by approximately 28 per cent on that for 1939. The total cattle population showed very similar increases To a large extent the increase was accounted for by an expansion of dairying and by greater numbers of cattle of purely dairy breeds. In the Isle of Man, Ayrshires have replaced Shorthorns to a marked degree. Economic conditions before the war, and the wider market for milk created by war-time requirements, caused many farmers not merely to switch from cattle fattening to dairying but to specialize in certain dairy breeds. In more recent years, the introduction of an Attested Herds Scheme, with its bonus payments on milk output, and, be it noted, the acquisition of holdings in the Island by people from " the adjacent Island " with leanings towards dairying, has increased the Island's milk production and encouraged still further the importation and breeding of Ayrshires.

These developments have produced a problem of their own. It is thought, in some quarters, that the time is fast approaching, if, indeed, it has not already arrived, when milk production here has reached saturation point. According to recent reports in the agricultural press, the same problem is causing some anxiety in Great Britain. Certainly, in the Isle of Man, the question of the disposal of surplus milk is creating difficulties. Cream may be sold *ad lib.*, but the only other means of disposal at the moment is by cheese-making. The output of milk, in an area as small as the Island, is insufficient to justify the expense of installing plant to manufacture other products. There are, too, other factors which are of wider significance than local circumstances indicate, and which add to the complexity of the situation: the effect, for example, of the decontrol of prices for certain items of dairy produce is impossible to forecast.

As in Great Britain, pig prices have not shown seasonal variations. Before the war, all possible steps were taken to encourage pig-feeding, and the Island had reached the stage when a Manx bacon factory was almost a practicable proposition. The difficulty of obtaining protein-rich feeding-stuffs to balance rations composed otherwise of home-grown cereals and home-milled wheat offals bore heavily on pig producers. In 1947 the output

of fat pigs was less than half that of 1939 ; in 1948 it just exceeded one-quarter of the 1939 figure, and only in 1949 did it regain the 50 per cent mark. Today, however, breeding sows, which, in 1945 were 32.7 per cent below the 1939 number, are increasing, and are only 18 per cent less than before the war.

Despite the scarcity of protein-rich foods, poultry stocks have increased greatly. Not only are they 52 per cent above the 1945 figure, but they are practically 33 per cent above that for 1939.

Horses used for agricultural purposes present a sorry story of a steady decline, without, apparently, any prospect of recovery. They now number less than half those on the Island in 1939. The diminution, almost to vanishing point, of heavy stallions travelling around Manx farms is almost sufficient commentary. For the mechanically minded, there is the consolation that the number of tractors is, today, nearly seven times as many as before the war—almost, but not quite, one per farm ; and the average size of holdings in the Island is only 50 acres !

Artificial Insemination The Board of Agriculture and Fisheries established an Artificial Insemination Station in 1943, primarily as a war-time measure. Its chief aim, in the words of Mr. D. W. Kerruish, the Board's Veterinary Officer, was " the improvement of livestock—to make available to every farmer a first-class bull at a reasonable fee". Writing at the end of 1948, Mr. Kerruish stated : " It was estimated that the average yield of Manx cows in 1939 was 396 gallons per year. The fact that one group of cattle born as a result of artificial insemination has given an average of 634 gallons in their first lactation is an indication of the improvement that can be expected as a result of this method of breeding."

The Board began with one Dairy Shorthorn bull. A second was soon found to be necessary, and, because of the number of Ayrshire herds established on the Island, an Ayrshire bull was added. Some two or three years ago a Scotch Shorthorn bull, a proven sire from the Board's Experimental Farm, was transferred to the Station, but the demand was almost exclusively for dairy bulls. In 1948, when a Calf Subsidy Scheme had made good ground, a Hereford bull was acquired, and more recently, in August, 1949, a Friesian bull also. The progress of the scheme is shown by the following figures :

Year ended December 31	Number of Inseminations
1943	300
1944	531
1945	893
1946	1,052
1947	1,297
1948	2,353
1949	3,470

The inseminations during 1949 were as follows :

Dairy Shorthorn (2 bulls)	1,923
Ayrshire	289
Friesian	283
Hereford	889

In addition, semen was obtained to meet special demands, namely :

Aberdeen-Angus	44 inseminations
Jersey	15 "
Kerry	7 "

The rate of inception has been good—over 70 per cent.

Milk Records Scheme Although, since the development of the tourist industry, milk production has been an important section of the Island's agriculture, Manx farmers have been slow to interest themselves in milk recording. The explanation lay, probably, in the predominantly beef character of the majority of the cattle kept, and it was not until 1945, by which time dairying had become much more widely practised and purely dairy breeds of cattle had assumed much more important proportions than previously, that a Milk Records Scheme, based on the National Milk Records Scheme of England and Wales, was introduced by the Board of Agriculture and Fisheries. At first, its rate of progress was distinctly modest, but the introduction, in 1949, of an Attested Herds Scheme accelerated matters considerably. This latter scheme included a provision for the payment of a cash bonus on milk produced by attested herds. The bonus—4d. per gallon to producer-retailers and 3d. per gallon to producer-wholesalers—is paid either on an assumed average annual yield of 400 gallons per cow or on the amount of milk actually produced by the herd as shown by the records under the Milk Records Scheme. The growth of the scheme is shown by the following figures :

Year ended March 31	Number of Members	Number of Cows Recorded
1946	14	231
1947	15	323
1948	22	443
1949	29	573
1950	55	906

At the time of writing the membership stands at 71, and the number of cows being recorded at 1,130.

The Attested Herds Scheme Farmers are, reputedly and not perhaps unnaturally, considered to be conservative. Manx farmers are no different in this respect from farmers elsewhere, but once they are convinced of the merits of a new scheme or a new method, they take to it wholeheartedly. For several years there have been farmers who, from time to time, have decided to free their herds from tuberculosis. For most of them it proved expensive, but their enthusiasm was not affected. At various times the Board of Agriculture and Fisheries considered schemes for the eradication of bovine tuberculosis, either on a voluntary basis or as a compulsory measure. Ultimately, early in 1949, a scheme for attested herds was put into operation.

The scheme does not differ materially from that of England and Wales, but two points of interest may be noted. First, before the official test is made, the market value of each animal is determined by agreement between the owner of the herd and the Board's Veterinary Officer, and, if they fail to agree, an independent valuer, whose decision is final and binding, is appointed by the Board. " Market value " is defined as " the price which might reasonably have been obtained from a purchaser in the open market who had no knowledge of the existence or suspected existence in the animal of the symptoms of disease disclosed by the report of the Inspector, except such knowledge thereof as might reasonably have been obtained by inspection of the animal".

Secondly, as has already been noted in connection with the Milk Records Scheme, a bonus is paid on milk produced by an attested herd. For attested herds of beef breeds a bonus at the rate of £4 per year is paid for each heifer or cow in calf or in milk.

Up to the end of May last, 130 herds, with a total of 4,009 cattle, have been subjected to the official test, and 89 herds have received certificates of

attestation. A further 18 herds are awaiting test. The proportion of reactors has been 26.8 per cent.

The farmers' response to the scheme has been such that, by May 1, 1950, it was possible to schedule an area in the extreme south of the Island, embracing 14 herds with 383 cattle, as an eradication area, and to prohibit the movement of cattle into the area except under licence.

The Agricultural Marketing Act Any account of Manx agriculture since the war would be incomplete without a reference to alterations which have been made to the Agricultural Marketing Act, and which now play an important part in the industry's economic welfare. The original Act, passed in 1934, provided for the constitution of an Agricultural Marketing Society, composed of producers elected by all the holders of land in the Island. The Society's function is to formulate Marketing Schemes for items of agricultural produce, and then, when a scheme has been approved by the Legislature, to administer it. The administration is done through Executive Committees of producers of the product covered by the scheme. The Act also provided for the setting up of an Advisory Committee, consisting of three representatives of producers, appointed by the Board of Agriculture and Fisheries, three representatives of consumers, nominated by the Governor and approved by Tynwald, and an independent Chairman appointed by the Governor. Its duty was to advise the Governor on all matters relating to the importation or exportation of agricultural produce.

Initially, the Marketing Schemes, of which there are at present three, covering fat stock, milk and potatoes respectively, dealt almost solely with price regulation. During the war, price regulation became a matter of Government policy, and the machinery existing under the Agricultural Marketing Act of 1934 was felt to be, in many ways, inadequate to meet the new circumstances which had arisen.

In 1948 two new Agricultural Marketing Acts were placed on the statute book ; they altered, materially, the scope of the original Act. First, the Advisory Committee was abolished, and its functions transferred to the Board of Agriculture and Fisheries. Secondly, provision was made for setting up a Marketing Committee of the Board. The Committee consists of seven members—the Chairman of the Board, three members of the Board to represent producers of agricultural produce (members of the Board who are, or have been, producers themselves are preferred before other members, and, for the purposes of this selection, a producer is defined as "a person who is in occupation of an agricultural holding of not less than 50 acres or a person who has previously been in occupation of such an agricultural holding for not less than three years "), and three persons nominated by the Governor and approved by Tynwald to represent consumers.

The Marketing Committee is charged with the duty of making recommendations to the Board on matters affecting the importation and exportation of agricultural prices and on prices to be fixed for a scheduled list of agricultural products. Before making any recommendations, the Committee must consult the Agricultural Marketing Society and also " any body or bodies representing persons interested in the sale of the agricultural product or products to which their recommendation applies".

The next step rests with the Board itself. The 1948 Acts empower the Board to make Orders controlling the prices at which, and the conditions on which, agricultural products shall be sold, but the Orders are always subject to the approval of the Governor.

EGG PRODUCTION AT LOWER COST

J. F. WILLERTON, N.D.P.

County Poultry Advisory Officer, East Riding of Yorkshire

RISING costs of egg production are turning commercial poultry-keepers' thoughts towards management methods which will give good egg yields, particularly during the period of higher prices, with a minimum of cost for food, labour, stock replacements and capital equipment. At the Annual Poultry Conference at Bridlington, organized by the East Riding C.A.E.C. and the N.A.A.S., three methods of interest to East Riding farmers were described by farmers already using them successfully.

Hen Batteries Mr. J. J. Martland of Ormskirk, Lancs, reviewed his methods and problems with laying batteries. To set a reasonable production target he emphasized the need to know the cost of keeping a bird until she goes out of the battery at 18 months old. His estimate was :

	s.	d.
Cost of day-old pullet plus cost of rearing to point of laying	16	0
Food during its laying year	32	6
Labour—1 man at £250 a year to manage 1,000 birds (with "auto-feed" possibly 2,000=2s. 6d. per bird)	5	0
Depreciation of plant	5	0
Water, lighting, repairs and sundries	3	6
Total ..	62	0
Less carcass value of hen going out: say 4 lb. at 1s. 6d. per lb.	6	0
	56	0

(The value of manure is set off against the hazard of disease or accident)

Purely to cover the cost of food and maintenance, therefore, the hen has to produce at least 14 dozen eggs averaging 4s. per dozen in the laying year.

The battery poultry-keeper's only hope of profit is to produce more eggs than this basic fourteen dozen and by selling a relatively large proportion of them in the high price period. Allowance must be made for a month in the cages to get the pullet into production and a month at the end of the season for cleaning and disinfection. This will require a rate of production of 60 per cent during the effective ten months, and allows no margin for pullets that break down on the point of lay or which lack resistance to disease or the capacity for sustained egg production.

If the right sort of bird is put into the cage and given regular supplies of proper food and fresh water, with adequate air and light, she will lay and keep on laying ; the wrong sort of bird will fail, even under the most careful and painstaking management. Skilled breeding and rearing is the crux of the production problem, and Mr. Martland emphasized the necessity of buying good stock.

Mr. Martland prefers a light-heavy cross to a heavy-heavy cross, since the food consumption is appreciably less. The early broods up to the middle of March are housed intensively and the later lots reared in small units outdoors. To minimize the danger of overcrowding, Mr. Martland uses the range shelter rather than the more usual night ark. In these, each bird has its own length of perch, well protected from the wind yet with unrestricted ventilation, and the healthy development of the pullets simplifies in advance the problem of battery management. Food at this stage is kept simple and bulky and plenty of oats are fed.

Before housing the pullets there is a thorough clean up of the batteries and the battery house, and Mr. Martland has installed a steam jenny which generates large quantities of steam automatically mingled with a cleaning solution.

The battery houses are light and well ventilated but unheated, and the roof is insulated at a cost of about 3½d. per sq. foot. Mr. Martland's batteries are four tiers high. He considers that the three-tier type is more convenient to work with, but the extra tier is economical of building space. A building 100 feet × 17 feet × 8 feet will house 1,120 birds comfortably.

The birds are dusted with insect powder on caging and remain free from body parasites. The change-over from grower to laying rations is made gradually during the first two weeks, and the pullets thereafter receive a battery mash containing 18 per cent protein, and supplements of grass meal, minerals, and cod liver oil. Feeding is *ad lib*, with an added evening feed of grain or pellets. Two ounces of limestone grit per week and 1 oz. of flint grit per month are sufficient. Better shell texture has been obtained by mixing limestone grit evenly with the week's supply of mash, rather than feeding it as a single dose.

The speaker said his battery houses had been fitted with fluorescent tube lights but that he would not go to the expense again, ordinary electric bulbs being satisfactory and much cheaper to install.

A time switch automatically provides half an hour's evening light, and sufficient morning light to give about twelve working hours out of twenty-four. Care is needed when cutting down the period of artificial light in the spring. A too severe cut can throw the birds into a moult. Culling for obvious ill-health, fatness or unproductiveness is practised weekly.

Mortality last year was 14 per cent (it has been higher in the past), but by improving the quality of pullets put into the batteries it is hoped to reduce the death-rate still further.

Mr. Martland considered the present level of profit in poultry-keeping a little below the safety line, but advised the efficient poultry man to " set his teeth and stick it out".

In conclusion, the speaker made a strong plea for the good marketing and effective presentation and advertising of home-produced eggs and poultry meat, and instanced the present slump in the sales of hens for killing as an example of what the producer might expect if the consuming public were not made more poultry-conscious.

Deep Litter Mr. J. Sutton, of Longton, nr. Preston, outlined his experiences with the intensive deep litter or built-up litter system. He has converted a dilapidated barn to provide a two-storey building with 1,500 sq. feet on each floor. One pound of hydrated lime is spread on the floor for each 6 sq. feet, and this is covered with 4 inches of wood shavings. For perching, a dual-purpose food trough has been designed, raised 21 inches from the ground with rails at each side on which the birds stand to feed by day and sleep by night. The rails are so spaced from the trough (4 inches) that the birds sleep heads towards the centre, tails outwards, thereby avoiding risk of fouling the food with droppings. The floor area is thus free of fixtures.

To begin with, the litter was forked over every two or three weeks, and new shavings added, and this was continued until the summer weather made the forking over less essential. (The troughs are moved about to secure an even distribution of manure over the floor.) The depth of litter is now 10–12 inches.

The litter and manure break down to a compost and it is essential not to disturb the bacterial activity by cleaning out the litter during the course of

the year. The litter remains dry and slightly warm, which Mr. Sutton thinks is helpful to winter egg production.

The bacteriological processes involved are being investigated. Mr. Sutton recommended the following types of floor in order of preference :

1. An earth floor wherever possible.
2. A concrete floor.
3. A wooden floor with ventilation underneath (this would need a ½-inch thick covering of dry soil or compost to activate the breakdown of the litter).

A good type of drinking vessel is needed to avoid spilling which makes a messy patch round the drinker.

Mr. Sutton's feeding system is of interest :

7.45 a.m. 1½ oz. per bird mixed grain.

10.30 a.m. 4½ oz. per bird dry mash—left-over food from the previous 24 hours being removed.

4.00 p.m. ½ oz. per bird pellets, plus additional pellets to the same amount as above-mentioned "left-overs".

This ensures a controlled feeding system, with pellets to stimulate consumption to at least 5½ oz. per day. Production has been good and consistent—from September 1, 1949, to May 1, 1950, it has varied only between 53 and 60 per cent. This feeding routine also avoids monotony. Vices such as egg-eating, feather-picking, and cannibalism are not automatically lessened by deep litter, but a feeding system as outlined and not too big a flock, so that the birds have an adequate floor space, will reduce the risk. With flocks of 200–400 birds, 4 sq. feet per bird is needed. If this size of flock and rate of stocking is exceeded, Mr. Sutton said, it would be necessary to use beak fitments as in the U.S.A.

With regard to types of litter, Mr. Sutton uses wood shavings because he can get them for nothing. Chaff and chopped straw could be used by arable farmers for the same reason. Alternatively peat moss or sawdust could be utilized. The speaker suggested that one man could easily do all the routine work for 5,000 birds in a 47-hour week. The main savings in labour are due to the freedom from cleaning out, the compactness of the units, and the clean eggs.

Strawyards Mr. Geoffrey Sykes of Salisbury, Wilts, related his experiences with the strawyard system of housing laying hens which he has pioneered. The main claims made for it may be summarized as follows :

1. Low capital costs—either in erecting a new house and yard or converting existing buildings. The costs suggested range from 4s. to 10s. per bird.
2. The greater health of the birds compared with those intensively housed, due to fresh air and direct sunlight.
3. The reduced risks of such vices as egg-eating and cannibalism due to greater space per bird and the greater opportunities for exercise.
4. Compared with either outdoor poultry-keeping or purely intensive methods, it is relatively foolproof. Mr. Sykes said, "I think one in four producers are successful with folds, one in five with free range, and four out of five with laying cages, but the capital cost of cages is too great."

Some Other Points In the discussion which followed Mr. Sykes was asked about the effect of heavy snowfall on the strawyards, and he replied that straw could be put on top of the snow to make the birds

comfortable, and in any case, there will be less shovelling to do to get to the birds than with fold units or range houses.

Regarding capital costs, Mr. Martland stressed that the depreciation costs he had mentioned included all subsidiary equipment such as his hammer mill, food trolleys, etc., items which were often overlooked in making comparisons.

Mr. Sutton explained the suitability of second-storey accommodation for deep litter, which could not be readily adapted for use with an open yard.

The use of either a darkened egg-laying room or community nest-boxes was strongly recommended to prevent egg-eating.

All the speakers emphasized the advantages of first-year, spring-hatched birds for high winter egg production.

In reply to a question, Mr. Sutton strongly recommended the establishment of deep litter in the warmer and drier months of the year, and he also recommended routine vaccination of all birds in large flocks against fowl pox.

OUTDOOR VINE GROWING IN ENGLAND

ROY HAY

MANY reasons have been advanced for the decline of vine growing in England. Among these has been suggested a change of climate, but, indeed, if the climate has changed at all it is probably for the better. Another is that it went down before the attack of fungus disease. But the true causes of the disappearance of the vine seem to have been the dissolution of the monasteries and the rise of wealthy trading, shipping and importing interests and with it have gone the cultural skill of the growers and the accumulated vine lore of centuries.

In the England of William the Conqueror there were thirty-eight Saxon vineyards. Essex, Berkshire, Middlesex, Hertfordshire, Worcestershire and especially Gloucestershire were great counties for the vine, and, according to Henry III, the finest grapes in England came from Halling in East Kent. It may come as a surprise that the swampy lands of Lincolnshire and Ely were productive of excellent grapes, and some of the figures given of production costs make fantastic reading today. If the old records are to be believed, 1,600 gallons of wine annually was apparently the yield from a vineyard of about 4 acres.

Coming down to more recent times, grape growing for long lingered in a few isolated places, and in the early part of the present century was mainly represented by Lord Bute's vineyards in Glamorganshire. The variety *Gamay Noir* flourished there, and the wine realized 115s. per dozen bottles in 1882.

It is interesting to ponder upon this surprising fall from grace of what might have been a major crop in Britain. It brings other parallels to mind—tobacco growing for instance—and we begin to wonder whether, had circumstances been different, our plant breeders and technicians might not have evolved varieties and processes suitable for Britain and so made us independent of the foreign currency difficulties that beset us today. Now, with wine as with tobacco, international exchange difficulties and high excise duties have provided a stimulus to experiment which has never before existed. Out of the concentrated research which has now been directed to both these crops anything may come.

The Promise of Wine to Come It is to Mr. R. Barrington Brock that much of the credit for reopening the question of vine growing in Britain is due. In time of need Britain is fortunate in nearly always finding the right man at the right moment, and Mr. Brock is a cautious investigator, seeking only to find out the facts, refusing to be stampeded into making premature pronouncements and concerned only with discovering everything that carefully controlled experiments can reveal on the complicated problem of successful vine cultivation. At Oxted he has planted a large experimental vineyard, where he has gathered together 4,000 *ceps*—that delightful French word for an individual vine—and he has brought varieties which flourish in climates akin to our own and in soils similar to those which we can find in parts of southern England. From his experiments many interesting facts have come to light.

To these is now added the weight of Mr. Edward Hyams' views, expressed in his book, *The Grape Vine in England*•. While we may be expert in growing grapes under glass, we know practically nothing about growing them in the open, and Mr. Hyams states categorically that no English horticulturist who is not a vine specialist is to be trusted in the matter of vine pruning. It is early to begin to make any recommendations, and much more work must be done, but some points are now fairly clear.

Mr. Hyams sets out to discover to just what extent grapes were grown in England in the open ; why vineyards passed into disuse; and what are the pre-requisites for successful vine growing at the present time.

The historical chapters are extremely well done. We learn that the genus *Vitis* is older even than *Homo sapiens* himself, and the chapters which describe the spread of the vine hand in hand with civilization are more than an interesting historical essay, for, in this ecological study lies the root of the whole problem.

Mr. Hyams has been at great pains to obtain analyses of soils in the great vine-growing areas of France and to seek out parts of southern England where similar soil conditions can be found. He has done the same with temperature and rainfall, and all this information is set out in tabular form which reveals a surprising number of places in Britain where conditions conducive to successful vine growing exist. The key to the problem appears to lie in soil and rainfall, for a vine growing in soil a little too rich in an area where the rainfall is a little excessive will not bear worthwhile crops. As such conditions cannot be controlled in the open, the growers' remedy lies in the choice—or maybe breeding—of stocks and varieties adaptable to the conditions and in pursuing a technique of pruning and cultivation best suited to them. Fortunately the vine is an extremely variable plant, and there is abundant hope that objective breeding may produce both stocks and varieties even better suited to this country than any that exist at present. Mr. Brock has already published interim suggestions regarding varieties ; as to stocks, we are fortunate in Britain in being free from phylloxera, which permits us to grow vines on their own roots and so relieves us of the burden imposed upon our French friends of grafting on to phylloxera-resistant stock. Whether, if vine growing increases in Britain, the phylloxera can be kept out of the country we do not know, but it will certainly be worth every precaution and the utmost vigilance to keep this pest from our shores.

Mr. Hyams, while not dogmatizing about varieties, is a little more definite on the subject of pruning, and it appears that for English conditions the Guyot system is likely to be the best. Late pruning—i.e., in December or even January, possibly later—is also strongly advocated, since early pruning

• The Bodley Head. 16s.

tends to stimulate the vines into premature growth, thereby increasing frost danger to the young shoots. Planting distances are a little more debatable ; a yard apart each way is considered a reasonable distance, but the tendency should be to plant vines closer than this rather than further apart to ensure a certain amount of "starvation" through root competition. On the question of the ideal site, Mr. Hyams is precise and states that " the vineyard should be planted on a slope facing south or south-east, so that it will be exposed to light and air but protected from the north and from the rain-storms of the west . . . Give the vines all the help you can, . . . but remember that they are quite hardy, accommodating plants and will manage very well, however handicapped by the weather exigencies of an awkward site".

In these pest- and disease-conscious days, no study of any crop is complete without reference to these troubles, and on the subject of diseases an interesting cleavage of opinion arises. Mr. Hyams refuses to accept the opinion that vineyards disappeared from England through the incidence of fungus disease. He points out that although the vine is very prone to attacks by mildew, which can be completely disastrous, it is no more difficult to control than many other diseases. Appropriate sprays applied often enough should remove any fear of this trouble. The phylloxera we do not have to worry about at present, and so far, in the Oxted experiments, no other pests have made their appearance. Thus it seems that in the vine we have a crop which holds out every promise of being reasonably trouble-free.

The work of Mr. Barrington Brock, Mr. Hyams and others is slowly beginning to bear fruit. We hear of vineyards being established under commercial conditions in southern England, some quite small, others larger, and one containing 1,000 vines. It is too early to predict what progress may be made in the years to come ; there are those who dream of vine-clad hillsides, of wine festivals, or vintage years, of brandy stills and all the delightful concomitants of the wine industry. They may well prove right, and those of us who find the present decade a trifle dull and work-a-day hope that it may be so.

THE EFFECTS OF ETHYLENE ON FRUITS AND VEGETABLES

J. C. FIDLER, B.Sc., PH.D.

Covent Garden Laboratory
Department of Scientific and Industrial Research

ETHYLENE is a colourless, inflammable gas, slightly lighter than air. It has a sweetish smell, and is present in coal-gas and in the natural gas sometimes found in oil fields. It is also produced in small quantities by some ripe fruits. How the gas was found to have an effect on the physiology of fruit is uncertain. Probably it was noticed that escapes of gas, used to heat rooms in which bananas were ripened, led to faster ripening. Be that as it may, ethylene has been used for ripening bananas in the U.S.A. since about 1930.

More is becoming known about the properties of ethylene and of its uses in the ripening of fruits, although the precise details of how the gas exerts its effect, or how it is produced by fruits, are still in doubt. Kidd and West's

studies of the respiration of apples and pears led to the discovery of the "climacteric" effect in respiration—that is, the sudden acceleration of the rate of production of carbon dioxide which takes place when fruits held at ordinary or high temperatures begin to lose their green ground colour and turn yellow, and to develop the odours characteristic of ripeness.

It was found that apples or pears in bulk ripened faster than single fruits did, and this was traced to the fact that individual fruits, ripening earlier than others, were giving off a gas which induced the climacteric, or in other words, began the ripening, of the slower-maturing fruits. Gane was the first to show that this gas was ethylene.

Apples and pears are cool-stored, or gas-stored, to reduce the rate at which they ripen. Stimulation of ripening by ethylene is an undesirable effect, and for this reason fruit which is to be stored should be cooled as quickly as possible. The cooling delays the onset of the climacteric, and thus retards the effect of the naturally produced ethylene on the slower-ripening fruits. For the same reason an early-maturing variety should not be stored with a late-maturing variety.

Ripening of Fruits The rate at which ethylene stimulates ripening depends on its concentration ; a high concentration produces a quicker effect than a low one, and a very low concentration of ethylene may have no effect at all. When apples or other fruits are cool stored, the objective is to reduce the rate of ripening as much as possible, and thus it is desirable to prevent the accumulation of ethylene by ventilating the store.

Our aim is sometimes to accelerate the ripening of fruits, or to ensure that all the fruit in a consignment ripens at a uniform rate. It is then natural to inquire if ethylene can help in obtaining the desired effect. As the following examples show, ethylene may be used to assist ripening of certain fruits, but it should not be used indiscriminately. The gas has no appreciable effect on some fruits, and produces undesirable effects in others.

In some countries it is standard practice to use ethylene, in a concentration of one part per thousand of air, in banana-ripening rooms. The ripening of the new varieties of banana, such as the Lacatan, which are beginning to arrive on our market, is considerably improved by ethylene.

In recent years the practice has been increasing to pick tomatoes either green or just beginning to turn, and to ripen them at about 65° to 70°F., usually with ethylene added to the air. Without going into the question of the desirability of this process, or comparison of the flavour of fruit ripened in this way with that ripened on the plant, it is known that the artificially ripened tomatoes are usually of fairly good quality. Artificial ripening of green or turning out-of-door tomatoes at the end of the season will increase the saleable crop. But whether ethylene is beneficial or not is doubtful. The results of tests which have been carried out in this laboratory over a number of years do not encourage the use of ethylene.

In our experiments, where the rates of ripening of similar tomatoes, whether grown outdoors or under glass, have been compared in air and in air + ethylene, we usually found that the ethylene had no effect. In some of the tests it was found that both lots of tomatoes ripened at the same rate until three-quarters of them were ripe, and then the sample treated with ethylene began to go ahead. We noticed faster ripening of the whole sample treated with ethylene in a few experiments only, in 1948. The tomatoes used in our experiments in 1949 showed no response to ethylene.

W. H. Smith has done extensive work on the effect of ethylene on English plums, and his general conclusion is that its use is not desirable. He used

the varieties Myrobolan, River's Early, Czar and Monarch, and concentrations of ethylene ranging from 1 part in 50 of air to 1 part in 150,000. The plums treated with ethylene softened more rapidly than those in air alone, and they changed colour and developed the typical odour of ripe plums faster. But their taste was unaltered, and analyses showed that they were no less acid or more sweet than the plums which had not received ethylene. Smith also frequently noticed that the colour of the plums which had been given ethylene was not normal.

This behaviour seems to be typical for all plums, with one exception—the South African Kelsey plum. This is reputed never to ripen normally, even in South Africa, but Putterill showed that when Kelsey plums were given acetylene they ripened normally. The really ripe Kelsey plum is purple, and not the yellow-orange colour normally seen in this variety. We have shown that ethylene produces a similar effect to acetylene, and some merchants now treat Kelsey plums in this way before selling them.

Some citrus fruits do not produce ethylene during storage ; the lemon is one of them. Thus storage of yellow lemons with green lemons does not lead to shorter storage life of the less mature fruit, as would happen with, for example, apples. But Biale has found that if rotting lemons are present in the store, the sound lemons will colour faster and have a shorter storage life. He has shown that one of the species of *Penicillium* which causes the rotting gives off ethylene, and that lemons are sensitive to this gas. The rate of respiration and development of colour are markedly accelerated by the ethylene given off by the mould.

Before leaving this discussion of the effect of ethylene on the rate of ripening of fruits, there is one interesting observation to record. In connection with experiments on the effect of volatile substances (including ethylene) on apples during storage, analyses have been made of the amount of ethylene present in gas stores. The results were astonishing. It was found that a gas store containing Bramley's Seedling apples could contain one hundred parts of ethylene per million, and that the concentration of ethylene in a store containing Cox's Orange Pippin apples could rise as high as six hundred parts per million. Such concentrations in air would lead to rapid ripening of the apples, yet we know that apples can be kept in a firm condition, with green ground colour, for as long as it is economically necessary to do so, in gas The experiments have not yet shown us if ethylene has any marked effect on the respiration of apples in gas, and we are now trying to find out what happens if we remove the ethylene.

Other Effects of Ethylene Ethylene can produce effects on fruits other than stimulation of respiration. Kidd and West have shown that one type of spotting of the lenticels of apples (such as is caused on Bramley's Seedlings if they are put into a store containing Worcester Pearmain apples) is similar to that caused by ethylene.

There are sensitive chemical methods for detecting the presence of ethylene, and determining how much of it is present. The most sensitive tests for ethylene, however, are the so-called " biological " tests, which depend on the way parts of plants respond. The " sensitive plant " (*Mimosa pudica*) has leaves and petioles which collapse when they are touched. The leaves also collapse if the plant is placed in an atmosphere containing ethylene. If the concentration of ethylene is more than a few parts a million, and the exposure is prolonged, the plant sheds its leaves. The elongation of many seedlings is prevented, or slowed down greatly, by ethylene. Concentrations as low as one to ten parts in a million parts of air produce marked

effects. Thus one can test for the presence of ethylene in a stream of air by passing it over germinating seedlings, and comparing their rate of growth with that of similar seedlings kept out of contact with ethylene.

The sprouts produced by potatoes in store are young plants, and it is therefore not altogether surprising to find that the sprouting of potatoes is prevented by ethylene. Furlong has stored large quantities of potatoes at 45° F. in a store containing one part in ten thousand of ethylene, and in another store without ethylene. At the time that the potatoes in air had all sprouted, with shoots of 6 inches maximum length, only 2.8 per cent of the potatoes treated with ethylene had sprouted, and the longer shoots were one-sixteenth of an inch long.

Experiments carried out in America have shown that ethylene can be used to blanch celery, but preliminary experiments last year in this laboratory using the variety Market White, were unsuccessful. We found that green celery, stored in the dark, blanched as rapidly when kept in air as when given ethylene. The blanching of green celery is due to destruction of the pigment chlorophyll. It is known that ethylene often hastens the disappearance of chlorophyll from green fruits. The Valencia orange develops its yellow pigments on the tree, but at certain times in the picking season they are masked by chlorophyll, so that the oranges are green. They are "degreened" by holding them at a high temperature, and high relative humidity, in the presence of ethylene. This treatment has another effect : the oranges shed the "buttons," or stalk attachments. With oranges from some regions this results in a reduction of stem-end rotting.

The manner in which such a relatively simple compound, ethylene, can exert such profound effects as those described above, is one of the most baffling and interesting problems of plant physiology. Even with the increasing refinement of experimental methods which is rapidly taking place it may remain an unsolved problem for some years.

This paper was prepared as part of the programme of the Food Investigation Organization of the Department of Scientific and Industrial Research.

OAK SPALE BASKETS

F. S. Stothard

Rural Industries Bureau

BENEATH the wooded slopes which run through Westmorland to Barrow-in-Furness there are several small country villages which shelter an ancient craft. Only the smoke which rises from some of the tumbledown huts gives a hint of habitation, but inside, one of the oldest crafts of the country is still practised. Here the murky light seeps through the cobwebs across the window, and the oak spale basket-maker, or "swiller," is busy preparing his taws and spales, weaving them into the oval oak spale basket, or "swill" which is used by the farming fraternity.

Altogether there are only about thirty-five to forty workers in this industry, which, except for a few isolated cases, is concentrated in the Ulverston district of North Lancashire. Many of these workers have their own business which has been handed down from father to son for generations. Few owners employ more than one or two workers. These workers, or "swillers" as they are called in the industry, have generally been in the trade

since they left school, and are now some of the finest craftsmen in the country. The craft still relies on their manual dexterity, as no satisfactory machinery has yet been invented to prepare spales from the tough oak poles available, or to do the intricate weaving necessary to fashion the swill. Perhaps their only claim to modernity is the formation of "Spale Baskets Limited," which is the most recent member of the Agricultural Co-operation Association Limited, and the only co-operative of craftsmen in the country.

Coppice oak from the hillsides of the district surrounding the lakes of Westmorland, together with local hazel for the rim, are the two materials used in the manufacture of the swill. Only the bottom length of the oak pole is used, as this is the toughest and most satisfactory part of the pole to work. On its arrival in the swillers' yard the oak is sawn into the required lengths, cleft into quarters and stacked to dry. Before being riven, these oak billets are boiled for several hours in huge, long, rectangular tanks which are heated by burning the wood unsuitable for riving. This waste wood totals about three-quarters of the intake into the yard, because knots, cross grain, and other irregularities in the oak render it unsuitable for riving.

Piece by piece, as required, the oak billets are taken from the boiling water and, whilst still hot, thin slats are riven or torn off by hand. A high degree of skill is necessary during this operation in order to maintain a standard thickness throughout the length of the slat. The thicker slats which are approximately $\frac{1}{8}$ inch are known as "spales," whilst the thinner slats, known as "taws" or "tars," are approximately $\frac{1}{16}$ inch in thickness. Not until the boiling tank is cleared of billets does the swiller move away from the steamy, humid atmosphere. He then smooths the taws across his knee with a sharp knife, before shaving the spales with a draw-knife on a large intricate wooden vice called a "mare". Sitting on one end of this mare, the swiller obtains clamping pressure by means of a foot pedal, thus leaving both hands free to use the draw-knife. A slight release of foot pressure and the spale is loosened ready to be reversed for finishing at the other end. The hazel rim, after being boiled to make it pliable, is bent to an oval shape on a machine, the prototype of which might have been designed by Heath Robinson, but which is really a combination of simplicity and efficiency.

With a few oval rims, and a heap of moist spales and taws by his side, the swiller next sits down to weave the basket. The spales are trimmed to the required size and attached across the hazel rim like the warp in weaving. The taws, which run lengthways and correspond to the weft, are interwoven between the spales, and bound round the rim in a cunning double twist. When moist, the spales and taws are quite flexible and are bent into the required shape. On drying they retain that shape and give the rigidity and strength so common in articles made from oak. Hand-holes are left at each end.

Once the swill is dry it is almost impossible to damage it by any normal rough usage. It can be thrown about, sat on, even jumped on with no apparent ill-effect, and it retains its shape indefinitely. In common with the majority of articles, however, it does not last for ever, and the bottom of these swills, subjected as they are to alternating wet and dry conditions (often they are dragged along the soil for many miles during the potato lifting season) do eventually rot and wear out. But this does not mean that these swills are then useless. A swiller can easily replace the old rotten wood and thus double or even treble the life of his product. Creosoting the bottom of the swill will help to prevent rotting. It is difficult to assess the life of a swill, as this depends on the purpose for which it is used. Under average conditions, however, a life of one to six years is quite normal, and cases are

known where swills have been in use for fifteen to twenty years without being repaired.

Many of these swills are used by Scottish potato growers who, for a number of reasons, prefer them to any other type of basket. Perhaps the greatest thing in their favour is the fact that they do not damage valuable seed potatoes. There are no sharp corners or edges, and the thin oak spales possess a degree of flexibility which allows them to give and act as a cushion when potatoes are flung in from a distance. Then again, the swills have a multitude of uses on the farm. They are extremely light and are invaluable for carrying grain, meal or chopped turnips, etc., at feeding time. They are widely used in horticulture for transporting weeds and plants, also for carrying coal, coke, fish, cockles, rubble, stones, and so on. They also perform a number of uses in the home, and many an infant has been rocked to sleep in an oak spale basket adapted as a cradle.

The craft of weaving baskets from riven oak has frequently been referred to as a " dying craft". However, one has only to see some of these swillers at work, and to hear the praises of the swill being sung by the people who use them, to realize that this is not so.

In many cases these craftsmen are seemingly simple, honest, country folk. Honest they are, but they are certainly not simple as far as their work is concerned. Not only do they produce the swill for agricultural, horticultural and industrial purposes, but they are continually experimenting to discover new uses for the material at their disposal. Log-baskets, shopping-baskets, both for carrying and with wheels for pushing, pram, cycle, linen, flower- and work-baskets are also made by these ingenious craftsmen in a variety of shapes and sizes to suit every pocket.

The disadvantages of making oak spale baskets are that the work is hard, the hours may be long, especially when boiling is in progress, and the hands are often permanently stained, cracked and calloused through handling the hot, wet oak billets. But, to the swiller, these disadvantages are far outweighed by the satisfaction derived from making useful baskets by hand, from materials which would otherwise have probably been burned as firewood, or left to rot in the woods. This is borne out by the fact that once a person enters the oak spale basket-making industry, he generally remains in that industry until he retires from active work.

FARMING AFFAIRS

World Meat World exports of beef in 1949 were about 12 per cent below the pre-war level, and pig-meat exports were under one-half of the 1938 figure, according to a report* just published by the Commonwealth Economic Committee. On the other hand, world trade in mutton and lamb recovered in 1949 from the low level of the preceding year and was 20 per cent higher than before the war. Exports of canned meat, although continuing to decline, were still 33 per cent greater than in 1938. Commonwealth countries supplied about one-half of the United Kingdom's total imports of meat in 1949, compared with about three-fifths in 1948 and two-fifths before the war.

* Meat. H.M. Stationery Office, 5s. net.

Output in both Australia and New Zealand has been well maintained in the post-war years, but in North America, where the numbers of livestock fell until 1949, production has fallen. Production in Europe was, by 1948, still below the pre-war level.

World exports of *beef*, which by 1947 had recovered to 85 per cent of the pre-war figure, fell substantially in 1948, but recovered again in 1949. Trade in *mutton and lamb* fell in 1947 and 1948, but some recovery was apparent last year when the total was still well above the 1938 figure. World exports of *bacon* which had fallen after the war, increased in 1949 with the recovery in European exports. On the other hand, world trade in *pork* declined continuously after the war until 1948, when an upward movement became apparent, as a result of heavier exports from Australia, New Zealand and European countries. World exports of *canned meat* had fallen by 1948 to about two-fifths of the record level for 1946.

Exports of beef from Commonwealth countries, which before the war accounted for about one-quarter of the world trade, rose to about 36 per cent in 1948 when Canadian exports increased considerably. Two Commonwealth countries, Australia and New Zealand, accounted in 1947 for about two-thirds of the total trade in mutton and lamb ; in 1948-49 the proportion rose to the pre-war level of 80 per cent. As bacon production in Denmark had only partially recovered by 1948, the Commonwealth share remained virtually unchanged at 60-65 per cent between 1946 and 1948 ; in 1949, however, the Canadian exports fell, while those from European countries increased considerably and the Commonwealth proportion fell to about 20 per cent. Commonwealth pork exports have recently increased in importance, while Commonwealth countries have retained about one-quarter of the world trade in canned meat.

The high level of consumption of carcass meat per head in the major producing countries was well maintained in 1946-47, but there was a slight falling off later, except in Australia, New Zealand and Argentina. Nevertheless, consumption in the United States during 1948 was 146 lb. a year, compared with 127 lb. before the war ; and in Canada 127 lb., as against 111 lb. ; in Australia and New Zealand, however, consumption was less than before the war. In the United Kingdom, meat consumption declined considerably in 1947 and 1948 but showed little further change in 1949, at about 74 lb. per head, compared with 119 lb. pre-war.

High-class Bacon Production The production of high-class bacon is not easy when feedingstuffs are limited and of variable quality. Tribute must therefore be paid to those pig feeders who have triumphed over war and post-war difficulties. The British housewife generally wants the lean Wiltshire cut, so that now, with competition from imported bacon, pig breeders and feeders must see that the home market is supplied with the bacon demanded. This is not a breeding or feeding problem alone ; it is a combination of both.

It is essential that the boar and sow should be of the lengthy type, prolific and maturing early ; this means a docile sow with good milking propensities. But all these qualities are not enough. However good a mother a sow may be, experience and trials have shown that good feeding in the early days and weeks of an animal's life is of the utmost importance if high-class meat is to be produced quickly. The pig is no exception. The sow's litter requires the advantage of creep feeding at 3 weeks onwards. It is for this reason that the Ministry of Agriculture and the Ministry of Food introduced

National Pig Starter, a high protein food suitable for creep feeding and until a fortnight after weaning.

The farrowing sow allowance of 10 cwt. can be taken in the form of 3 cwt. National Pig Starter and 7 cwt. ordinary cereal and protein as an alternative to receiving the whole 10 cwt. in ordinary cereal and protein. There has been an encouraging demand for National Pig Starter, but more pig keepers could use it with advantage. Application for the farrowing sow allowance should be made to the County Agricultural Executive Committee.

Creep feeding is simple and inexpensive to arrange. It just means keeping the sow away from the little pigs' food. A small trough in a corner of the sty, fenced by a strong hurdle is sufficient. When creep feeding, supply the food dry, but water should be available. If you want the best and quickest results creep feeding must be introduced, and National Pig Starter is available.

Production of Ware Potatoes

In these times when farmers are asked to increase output of all crops, it follows that it can be accomplished only by increased efficiency, together with the growing of varieties and strains most suitable to conditions of soil, climate, etc. The potato, one of our staple food crops, occupies a special place in our crop husbandry, and in view of its proportionate high cost of production every step should be taken to ensure that reliable stocks of seed are planted.

Two grades of certified seed are available to the grower of ware potatoes. A stock which has an A certificate has been inspected during the growing season and found to be only lightly infected by virus and other diseases. When planted and grown under suitable conditions, such a stock should produce a crop well above average. For normal cropping stocks having an H certificate, which means that there was a higher percentage of virus diseases at the time of inspection, may be planted and under normal cultural conditions will give satisfactory crops. The planting of any stock not having a certificate is to be deprecated, for not only may the resulting crop be disappointingly low, but there is the risk of carrying eelworm infestation to clean land, to say nothing of the added risk of spreading virus diseases to other potatoes grown nearby.

Time of planting is all-important. April is the most suitable time for planting maincrop varieties. Early varieties may be planted at the end of February and during March according to district. It is estimated that one ton of crop is lost for each week that planting is deferred after the month of April, which indicates how important is the time factor in potato planting.

Although the conditions of growth in Scotland are rather different from those in England and Wales, nevertheless the basic operations of crop production are similar. A well-prepared Advisory Leaflet entitled *Ware Potatoes, Early and Maincrop** has been issued by the Department of Agriculture for Scotland. It deals with all aspects of production and much valuable information is presented in a condensed form. Those interested in potato growing should obtain this leaflet and give careful consideration to the advice it contains.

Fuel Supplies for Glasshouses in England and Wales, 1950-51

It has been decided to remove all restrictions on cropping of glasshouses in the coming season. Accordingly growers will no longer be required to sign an undertaking that they will devote a certain proportion of their heated glasshouse space to food crops in order to

* Department of Agriculture for Scotland Advisory Leaflet No. 15 (New Series), obtainable from H.M.S.O., or through any bookseller. Price 6d. (7d. by post).

obtain large coal. In lifting the restrictions on cropping, the Minister hopes that the Glasshouse Industry will continue to devote its main energies to the production of food crops.

As the amount of large coal available to the industry has not increased, growers will, in general, receive the same allocation as last year. As in previous years, because of the shortage of large coal, supplies of coke sufficient to meet growers' requirements will be substituted for at least one-quarter of the total allocation. The proportion of large coal will be reduced below three-quarters where it is established that a grower's heating system will work effectively on less.

Banking and the Farmer is the title of a new, and excellent, film issued by the Banking Information Service. In the capitalization of farming—that extra bit of land or that piece of useful equipment to offset labour shortage and save those valuable days at harvest time—it is often a matter of " the little more, and oh, what worlds away ! " The kind of help and other facilities that the local bank may be able to offer the ordinary working farmer is the theme of this film, which shows a bank manager in a typical market town dealing, in the course of his duties, with various aspects of farming : one customer wishes to buy a farm ; another, farming equipment ; a farmer wants an open credit in Scotland to enable him to buy cattle ; a customer needs help for the purpose of fruit tree spraying. The services are manifold and the advice costs nothing.

Copies of the film on both 35 mm. and 16 mm. can be hired free of charge from the Banking Information Service, 3 Lombard Street, London, E.C.3.

Grassland Fertilizers Scheme, 1950 Reference was made in the August, 1950, issue of *Agriculture* to the proposed new scheme to encourage the use of fertilizers for improving grassland and marginal land or ploughed up seven year old grassland. In the Statutory Instrument which has now been made to give effect to the arrangements in England and Wales and Northern Ireland,* the fertilizers eligible for assistance have been precisely defined and comprise all those commonly used, namely :

> Basic slag, Compound fertilizers (including " Nitro-chalk "), Ground phosphate rock, Muriate of potash, Sulphate of ammonia, Sulphate of potash, and Superphosphate of lime (ordinary and triple).

Forms of application for contribution under the scheme will be sent by the Ministry to *all* occupiers as soon as printed copies are available. In the meanwhile occupiers are again reminded that they should keep a record of the Ordnance Survey number and acreage of all grass fields and rough grazing land treated with fertilizers on or after July 1, 1950, the kind and quantity of fertilizer spread on each field, the cost per ton of the fertilizers, and the cost of any additional transport incurred when the fertilizers are not delivered direct to the farm by the supplier.

* Statutory Instrument, 1950, No. 1320, obtainable from H.M. Stationery Office or through any bookseller, price 2d. (3d. by post).

AGRICULTURAL STATISTICS : ENGLAND AND WALES

GLASSHOUSES

FINAL (RAISED) RESULTS

DESCRIPTION	Glasshouses (*a*)				Frames, Lights, Bells, Cloches etc. (*a*)			
	Square feet (000) (*b*)		Equivalent Acreage (*c*)		Square feet (000) (*b*)		Equivalent Acreage (*c*)	
	1949	**1950**	**1949**	**1950**	**1949**	**1950**	**1949**	**1950**
TOTAL AREA UNDER GLASS AT JANUARY 14 With heating apparatus	157,644	162,141	3,619	3,722	—	—	—	—
Without heating apparatus	24,102	25,897	553	594	—	—	—	—
TOTAL	**181,746**	**188,038**	**4,172**	**4,316**	**23,212**	**24,422**	**533**	**561**
AREA UNDER GLASSHOUSE CROPS AT JANUARY 14								
Lettuce	23,836	24,319	547	558	7,214	8,010	166	184
Other Vegetables and Herbs	4,881	4,067	112	94	2,648	2,407	61	55
Tomato and Cucumber Seedlings	12,029	14,652	276	336	28	30	1	1
Carnations	3,300	4,186	76	97	26	35	—	—
Roses	2,252	2,456	52	56	3	7	—	—
Orchids	377	368	8	8	1	1	—	—
All other Flower and Foliage Crops	12,395	16,422	285	377	1,948	2,142	45	51
All other Crops not specified above	6,878	8,104	158	185	1,383	1,589	32	36
Remaining Glass Area, being the area unused at January 14, or used for purposes not shown above	115,798	113,464	2,658	2,605	9,961	10,201	228	234
TOTAL	**181,746**	**188,038**	**4,172**	**4,316**	**23,212**	**24,422**	**533**	**561**
CHRYSANTHEMUMS	**1948**	**1949**	**1948**	**1949**	**1948**	**1949**	**1948**	**1949**
Area at December 1	17,657	20,492	405	470	402	335	8	7

(*a*) Excludes Holdings with less than 500 square feet of Glass. (*b*) Returned by Occupiers to the nearest 10 square feet.
(*c*) Calculated to the nearest acre.

THE MINISTRY'S PUBLICATIONS

Since the date of the list published in June, 1950, issue of AGRICULTURE (p. 145), *the undermentioned publications have been issued.*

Bulletin Copies are obtainable at the prices mentioned from the Sales Offices of H.M. Stationery Office or through any bookseller.

No. 77 Tomatoes (*Revised*) 2s. (2s. 2d. by post)

Leaflets Single copies of not more than than 16 leaflets (four in any group) may be obtained, free of charge, on application to the Ministry, 36 Chester Terrace, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from the Sales Offices of H.M. Stationery Office, net price 1d. each (2d. by post), or 9d. per doz. (11d. by post).

Advisory Leaflets

Group I. Livestock and Dairying

No. 364 Poultry Nutrition (*New*)

Group II. Pests and Diseases of Farm and Horticultural Crops

(A) *Insects and Other Pests*
No. 199 Wireworms (*Revised*)
(B) *Fungi*
No. 218 Dry Rot of Potatoes (*Revised*)

Group III. Pests and Diseases of Fruit Crops

(A) *Insects and Other pests*
No. 362 The Examination of Bees for Acarine Disease (*New*)
No. 365 Houseflies (*New*)

Group VI. Other Subjects

No. 352 Violets (*New*)
No. 353 Anemones (*New*)
No. 359 Leeks (*New*)
No. 363 Sugar Beet Pulp (*New*)
No. 367 The British National Hive (*New*)
No. 368 The Care of Farm-Stored Grain (*New*)
No. 369 Controlled Grazing with Electric Fencing (*New*)

Animal Health Leaflets

No. 25 Common Worms of the Pig (*Revised*—Superseding A. L. 312)
No. 40 Tuberculosis in Poultry (*New*)

Fixed Equipment of the Farm Leaflets*

No. 2 Financing Improvements to Land and Buildings (*New*)
No. 3 Farm Dairies (*New*)
No. 4 Grants and Loans for Co-operative Grass Drying (*New*)
No. 6 Farm Fences (*New*)
No. 7 Cattle Grids for Private Farm and Estate Roads (*New*)

Other Publications

Sugar Beet Virus Yellows (*New*)

Egg Packing Standards (*New*)

Rats and Mice (*Revised*)

Grants for Farm Drainage (*Revised*)

* Single copies of any one of these leaflets may be obtained free of charge, on application to the Ministry, 36 Chester Terrace, Regent's Park, London, N.W.1. Larger quantities must be purchased from the Sales Offices of H.M. Stationery Office, net price 3d. each (4d. by post), or 2s. 6d. per doz. (2s. 7d. by post).

BOOK REVIEWS

Estate Management for the Farmer. R. R. WARE. Geoffrey Bles. 10s. 6d.

Here indeed is rural estate management made not only simple but pleasant. From a Chartered Land Agent who occupies the key post of Director of the Ministry's Agricultural Land Service one may expect to receive sound knowledge and informed guidance on the problems which trouble the landowner, including (as that term does) the owner-occupying farmer. Knowledge and guidance are provided in good measure by Mr. Ware, but what is unexpected, and doubly welcome, is the atmosphere of informality and friendliness that makes this slim volume such good reading.

It is tempting to quote several examples of Mr. Ware's direct approach to the heart of his subject, but two or three extracts may encourage the reader of this review to order a copy of the book for himself.

As to Repairs : " The Chinese, so we are told, believe in preventive medicine and pay their doctors a salary while they are well, which is immediately stopped if they fall ill, and not resumed until they have recovered. It may be that in China land agents, too, are paid on the same sensible plan, drawing their salaries only so long as the buildings for which they are responsible are in good order."

As to the Law : " Keeping on the right side of the law may once have been a simple virtue. It has now become an acrobatic feat, like tight-rope walking, which is not to be achieved by the ordinary man without a good deal of experience and a spice of luck."

As to Agricultural Tenancy Agreements : " Englishmen tend as a race to attach more value to the spoken than to the written word. A verbal promise, we feel, is something which is within our control . . . A written promise, however, is quite different. We know that to commit ourselves to writing is to put ourselves at the mercy of the law . . . In short, we regard a verbal promise as final, but a written one as the preliminary round in a battle of wits. Foreigners, who, as so often, perversely do things the other way round, and enjoy a little imaginative freedom in verbal exchanges, but think that a written document puts an end to the game, find it all rather puzzling ; but they have learnt, we are told, to regard an Englishman's word as his bond, and an Englishman's lawyer as second to none, and this all helps with visible and invisible exports." (Nevertheless Mr. Ware proceeds, as one may expect, to urge the wisdom of having written tenancy agreements.)

The wise farmer, despite the deceptive ease with which he will be able to read through the whole book at one sitting, will recognize that there are unplumbed depths which he cannot fathom without the help of technical experts. He will (as Mr. Ware states in his closing comments) make full use of the service of professional advisers, and will continue to consult a qualified valuer when he buys or sells a farm ; a tenant-right valuer when he rents or leaves a farm ; an accountant while he runs a farm ; and an architect or surveyor when he wishes to alter his buildings.

Incidentally, a landowner who leaves the management of his property to a land agent but who likes to know something of his own responsibilities will find no better publication for enlightenment than *Estate Management for the Farmer*. *R.C.W.*

Isle of Man (County Book Series). CANON E. H. STENNING. Robert Hale. 15s.

During the past fifty years only two Histories of the Isle of Man, both differing greatly in scope and character from Canon Stenning's volume, have been published. Canon Stenning's long residence in the Island, his prominent position in educational and church affairs, and his close association with organizations and societies interested in Manx lore, Manx history, Manx antiquities, and, by no means least, motor-cycle racing have all qualified him to write this book ; in producing such an eminently readable, and at times racy, account of Manx history and topography, he has rendered the Island a notable service.

In applying himself to the formidable task of providing a succinct account of the Island story, Canon Stenning's devotion to scientific principles has been much in evidence : he has followed closely the dictum that " all history so far as it is not supplied by contemporary evidence is romance," but that has not prevented him from including an interesting chapter on Manx folk-lore and a representative selection of the more widely-known folk-stories and folk-customs. The theories about the origin of the famous " three legs sign " are duly noted and appraised.

Two of the most valuable sections of the book are those which deal with the Island's flora and fauna. Interest is added by the inclusion of an appendix giving a classified list of the native flowering plants, ferns and club-mosses with, where these exist, their Manx names. A similar appendix gives a list of fossils in the Manx carboniferous limestone.

If agriculture appears to be disposed of somewhat perfunctorily it is because knowledge of early Manx farming is very scanty : it was not, indeed, until the end of the eighteenth century that systematic accounts of farming conditions in the Island were available in the form of Reports " drawn up for the consideration of the Board of Agriculture and Internal

Improvement" in London. Also, the basic pattern of Manx farming has not altered materially during the past 100 years, although the standard of husbandry has improved immeasurably.

Special reference, however, is made to the evolution of the system of Land Tenure, a system which, though now approximating, but not, perhaps, as closely as the author appears to believe, to that in force in England and Wales, was nearly related to the Island's historical background and derived largely from Scandinavian practice. One notable instance cited is the "Tenure of the Straw," an ancient custom, now disused, for carrying out a sale of land by formally attending a Court Baron and making resignation of the estate by giving the buyer a straw before the Court as witness in place of any scrip.

Students of constitutional history will be specially interested in the very full details given of the evolution of the Manx Legislature, and, in particular, in the facts relating to the Manx Tynwald and its procedure, another institution of Scandinavian origin.

Canon Stenning has not been content merely to give an admirable account of the Island's history, geology and topography, but has dealt with every aspect of Manx social life and has traced the various developments down to the present day. It is more than a history: it is a valuable book of reference.

The volume is plentifully illustrated, and there is an adequate map.

G.W.H.

The photograph reproduced on page 1 of the art inset is from this book and is included by kind permission of the author and publishers.

Farmer's Progress. GEORGE HENDERSON. Faber. 10s. 6d.

This is a book which should be read and pondered by all who contemplate a life on the land. The author has made his own way in farming and not unnaturally is a very fervent apostle of self-help. It is doubtless true that what has been done can be done, even if it may sound a little more than is humanly possible. But the author has a brother. "The management was in a partnership which always put the farm first, and in this partnership the hopes, dreams and philosophy of the one have been realized very largely by the business organization and the mechanical knowledge of the other." It was by working twice as hard as ordinary labourers, living on half a labourer's income and re-investing the earnings that Oathill Farm of 83 acres, originally rented, now owned, was established from very little initial capital. For thirty years the author "has been out of the house before five o'clock in the morning and has gone steadily on, apart from meal-times, until seven at night, as a normal routine; and later, of course, in summer when poultry have to be shut up at dark. No Saturday afternoons off, four or five hours' work on a Sunday". Once the farm was established, however, he allowed himself ten days holiday every year and travelled as far as possible, seeing how others farm.

Obviously Mr. Henderson is a man preoccupied with his work, but who, however, as his literary attainments show, is somehow or other able to relax for profitable reading after a full-day's work in the open air. Even if you drop off to sleep, he says, your subconscious mind will store what you have been reading. His advice to anyone with the money and time to spare for agricultural education is to travel after learning the practical work on a good farm and the theory from books. There is, however, much to be gained from a residential course at an agricultural teaching institution besides book lore. There is the art of living as well as that of learning. Nevertheless the farming student will derive much useful information and many valuable hints from this truculent and triumphant farmer. Others may be constrained to think again whether the large farm is more efficient and more in the national interest than the small one, especially if it is a family affair.

J.G.S.

Ploughman's Wisdom. NORMAN CAREW. Faber. 15s.

This book by the Agricultural Officer of a large Sugar Cane Estate in Fiji is written as a reply to Faulkner's well-known *Ploughman's Folly*. Its contents are based on some of his experiences with sugar cane, beginning with a short and interesting account of the sugar cane industry in Fiji. The title of the book is misleading, as the author barely discusses ploughing—that is, the use of a mouldboard plough, but confines himself mainly to the use of the cultivator.

The experimental basis of the book is that the root system of sugar cane appears to need fairly good aeration and seems to become more extensive if it suffers a certain degree of root pruning. The author finds that in the tropical rainfall climate of Fiji it is desirable to use cultivators set 8 inches deep between the rows of cane, and to work almost up to the plants. He sweeps aside whole branches of soil science and botany that appear to be well-established by hundreds of careful experiments, and advances new theories of water movement in soils and of plant nutrition—all of which can be easily disproved by a few simple arguments and experiments.

E.W.R.

Machinery on the Farm. THOMAS HUTCHISON. Blackie. 17s. 6d.

Mr. Hutchison outlines in his book the development of both field and barn machinery, from the implements used in the past up to the present-day equipment available to the farmer. Only one example of the modern machine is given and no attempt is made either to describe the working of the machine in detail, to make any claims for the machine from the agricultural point of view, or to discuss its faults. No reasons are given for the particular choice of that machine which is not always the best example of its class.

Each machine or implement is treated individually and no relationship is discussed even between it and the power unit used to operate it; neither is its value to any system or organization mentioned.

The book gives no answer to a specific problem in that only one implement of its class is discussed, and does not give any indication of how the farmer uses these machines in the mechanization of his farm. The only exception to this is a very good chapter on threshing machines; but threshing machines are a contractor's tool and it is unfortunate that so much space should have been devoted to them at the expense of machines of more importance to the farmer, and machines likely to play a greater part in the agriculture of the future. The author states that machanization will solve our future food problems, but he does not indicate that the present range of machines will do so.

The book illustrates very clearly that Mr. Hutchison is an enthusiast of farm mechanization and to general readers he shows that a very wide range of machines is necessary to grow and harvest the range of crops normally grown on farms in this country. We are told that the small farmer's problems have been solved by the modern machinery available, but here the author is somewhat optimistic. The cost and range of machines make it almost impossible for the small farmer at this stage to contemplate mechanization. In dealing with the machines on the farm far too much emphasis has been placed on the fact that modern machinery has overcome all our difficulties.

As a record of the developments in the agricultural engineering industry the book is interesting without going into too much detail, but it adds little to what has already been written in further helping the farmer to decide in the mechanization of his farm.

F.S.M.

The English Rural Labourer. G. E. FUSSELL. Batchworth Press. 12s. 6d.

Mr. Fussell has set himself a big task in his latest book—nothing less than a history covering four centuries of the man-in-the-field, who for most of the period was also the average Englishman. His story travels from the Tudor peasant to the Victorian labourer; from leather breeches and doublet, via smock, to modern clothing; from cruck house to brick cottage. The author is concerned primarily with physical conditions, with housing and furniture, food and clothing rather than, for instance, education and recreation. And these aspects of life he describes with a wealth of quotation from contemporary sources, from wills and novels, the accounts of travellers, official reports, pamphlets, memoirs, and local histories.

The author has assembled an imposing crowd of historical witnesses; indeed his lengthy bibliography will be a joy to the student, despite the rather surprising absence from the book-list and index of the names of Henslow, Haggard and Flora Thompson. But the general reader will probably be more interested in the men and women who emerge from the darkness of the past to relate their experiences of rural life so many years ago. There were, for example, those Wiltshire householders who in 1679 compiled their pathetic but illuminating list of possessions, the beds, clothes and pewter dishes, destroyed in a now-forgotten fire. There is "Old Parr," apparently nearing his 150th birthday, detailing his diet in response to the inevitable question, "To what do you attribute your great age?" There is Crabbe and there is Cobbett and a host of others, some famous, some obscure, many now unknown. Mr. Fussell has certainly cast his literary net wide and has caught many interesting "fish".

He clearly believes in letting contemporaries speak for themselves. This historical method, however, has its defects as well as its merits and, in particular, it throws much of the responsibility of interpreting evidence on the reader who is not necessarily aware of the general social or economic background. This book might, for instance, have made clearer the fundamental distinction between the pre-enclosure peasant and the post-enclosure labourer, for the modern mind does not easily picture an agricultural system in which the landless man is a rarity. Again, I would have welcomed more information on the cottage crafts and village industries which once played such an important part in the rural community; after all, it was the craftsman, not the peasant, who led the old agrarian risings. Further, while Mr. Fussell is right, of course, in emphasizing the grimness and poverty of Old England, he might have added, for the sake of comparison, that the English countryman was far better off, both physically and politically, than most of his contemporaries on the Continent. Indeed, from Fortescue to Defoe this was one of the traditional and justified boasts of English writers.

N. H.

Poultry Book. HARRY ROBERTS. Ward, Lock. 6s.

Harry Roberts's *Poultry Book*, described as "a guide for small or big poultry keepers, beginners and farmers", has been revised. In the first chapter Mr. Roberts gives very useful advice to the novice starting, and sets out the qualities which he considers necessary for success. Many of these, as he so rightly says, are those which would ordinarily be required to ensure success in any walk of life. Anyone who has in mind embarking on the keeping of poultry for the first time could, with advantage, ponder the advice given.

The beginner is cautioned that however large or ambitious his plans may be for the future, he should start on a small scale and gain experience gradually. Although, rightly, much of the information given throughout the book is rather elementary, in places it is almost over-simplified, and not sufficiently comprehensive.

In a period of rapidly changing conditions, it is probably a mistake, in a textbook of this kind, to deal with temporary regulations, shortages, and controls ; some already no longer exist. There is, too, a good deal of repetition and one gets the impression of certain new material being superimposed on much that is rather out of date. It might have been better if the author had written the book afresh, rather than that he should have attempted to bring it up to date by a partial revision.

The chapters dealing with turkeys, geese and ducks are perhaps the most useful, and give many valuable practical hints, apparently based on the author's own experiences.

J. W. S.

Hybrid Corn (Maize) in Theory and Practice. GORDON HASKELL. The Biological Press. 5s.

This short monograph is the substance of a lecture given at the 1948 meeting of the British Association for the Advancement of Science. The introduction is concerned with a review of the normal methods of selection and how they failed to improve adapted American open pollinated maize varieties beyond a certain limit. It was then that recourse was made to the techniques of inbreeding and subsequent hybridization. The author discusses briefly the production of inbred lines and the various hybrid combinations now used commercially in America. There is an admirable résumé of the theories put forward to explain hybrid vigour in maize and a useful list of references is appended.

Since the author is engaged on research into the breeding of sweet corn, it is not surprising that most of the examples chosen for illustrating the hybridization of maize are for this crop. As the breeding methods are the same for sweet corn and field corn (maize), this does not influence the theoretical aspects of corn breeding. It may, however, account for the slightly ambiguous explanation of the commercial practices of using double hybrids in maize and single crosses in sweet corn.

The discussion on the future of hybrid maize in England and the Commonwealth countries could have been expanded. Further comments on the factors influencing the introduction of hybrid maize to countries other than America would have been of interest, especially as meetings organized by F.A.O. have led to the widespread testing of American hybrid maize in Europe, and the recent establishment of an Association for the Improvement of Maize to co-ordinate European research.

Specialists are unlikely to find much that is not already available in various American publications, but students and lecturers in crop husbandry will find the book a useful introduction to the major aspects of hybrid maize development and production. The price of 5s. for 23 text pages seems a little high.

G.E.B.

Agricultural Periodicals of the British Isles, 1681-1900 and their Location. F. A. BUTTRESS, *comp.* Cambridge, School of Agriculture. 2s.

The field covered is general agriculture, excluding the ancillary sciences botany, economics and veterinary medicine. Originally compiled for use in the Library of the School by its students, in its printed form the List will be welcomed as complementary to those of Aslin, Perkins and Fussell. It is hoped that this wider circulation will result in additional titles and locations being noted for inclusion in subsequent revisions.

Locations are given for 15 libraries in addition to references to titles included in the *World List* and the *University Union Catalogue*. There are many useful footnotes, and changes of title are covered by full references.

F.C.H.

BOOK REVIEWS

The Horticultural Notebook (4th Edition). W. E. SHEWELL-COOPER. The Technical Press. 10s. 6d.

Originally compiled by Mr. J. C. Newsham, the first Principal of the Monmouthshire Farm Institute, this publication was for many years the *vade mecum* of the practical horticulturist who had little time to spare for the reading of textbooks and other literature pertaining to his business. The fourth edition of this useful book was prepared by Mr. Shewell-Cooper who had a team of expert helpers to guide him, particularly on such matters as glasshouse construction and heating, and pests and diseases and their control. The preparation (or the revision for that matter) of a horticultural notebook calls for considerable skill as well as extensive knowledge. Horticultural practice today is so multifarious that it would be a clever author or reviser who succeeded in anticipating every need or provided the answer to every question. Still, in this instance the reviser might have used his blue pencil a little more. For example, there would appear to be little value from a horticulturist's point of view in the twenty pages of botanical description of British plants described, quite inaccurately, as a " Synopsis of the *Natural Orders* (sic) of British Flowering Plants". This is rather ancient terminology ; they are *families* today as all experienced botanists know quite well. Turning to more familiar ground, that of horticulture, there is little to complain about in the information given, though much of it seems to lag behind the general level of today's knowledge. For example, chrysanthemums are propagated, we are advised, " by cuttings taken from *the base* of the parent plants " . . . Modern practice, however, has included the use of stem cuttings which make plants quite as good as those obtained from basal growths.

The tree or perpetual flowering carnations, it is stated, are the offspring of *Dianthus caryophyllus*. Certainly a subject which has puzzled generations of skilled carnation growers cannot be dismissed in such a phrase. There is a missing link in the history of the perpetual flowering carnation which maybe we shall never discover. There is no proof that *D. caryophyllus* is the only parent as this statement implies.

Nevertheless, *The Horticultural Notebook*, as always, is good value for money.

A.H.H.

British Rainfall, 1947. H.M. Stationery Office. £1 1s.

Over England and Wales as a whole, 1947 was the driest year since 1933; Scotland had about its average rainfall, and Northern Ireland appreciably more than average. Totals for the year 1947 ranged from as much as 146.10 inches at Grib Goch on Snowdon to only 15.40 inches at Spalding, Lincolnshire. March was not only the wettest month of 1947 but also the wettest March on record in most districts. In contrast to this, August was rainless over much of the country and it was easily the driest August on record over the whole of Britain. The longest period of absolute drought recorded in this country since 1893 was 44 days—from July 29 to September 10, and this occurred at Wellingborough, Northants.

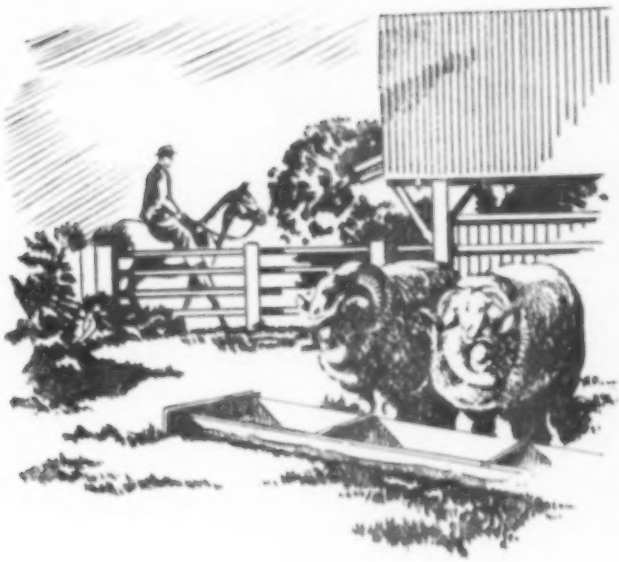
These facts are among the many presented in the eighty-seventh annual volume of the British Rainfall Association, a publication made possible by the co-operation of a large body of voluntary observers, working with the Meteorological Office.

The volume, which is arranged in two parts, is comprehensive and authoritative. Part I deals with the distribution, duration and intensity of rainfall, and Part II consists of tables compiled from figures recorded at some 5,000 stations in Great Britain and Northern Ireland.

D.H.

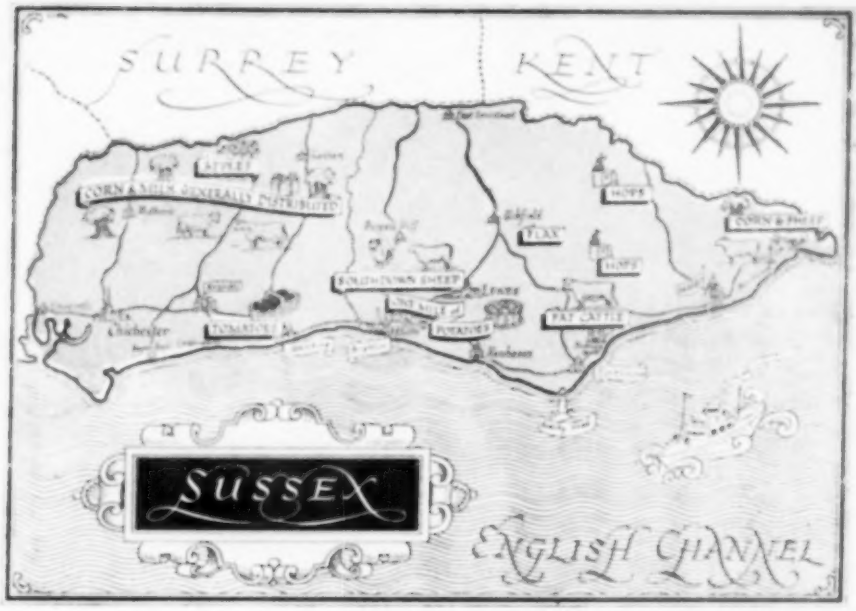
Printed in Great Britain under the authority of HIS MAJESTY'S STATIONERY OFFICE by Staples Press Limited at their Kettering, Northants, establishment

FARMING THROUGHOUT THE WORLD



Although sheep-raising is well-known as one of the principal sources of Australian wealth, the vast size of the industry is sometimes forgotten. Early in 1950, the sheep population in Australia numbered 115,000,000, 75 per cent being Merinos. So extensive are many of the sheep stations that aircraft are sometimes used to round up the flocks.

Lessons from the Counties



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To the north, Sussex barely escapes the tide of red brick that breaks over the North Downs from the vast turbulence of London. To the south, great winds from the sea shout over the coast towns before reaching the open spaces of the Downs.

Between the two rolling downland ridges, north and south, sheltered in the oaks woods of the Weald, are warm, red, tile-hung farms, mythical home of Puck in the days long past, and favoured retreat of film star and stockbroker today.

Their strong, clay soils can grow wonderful grass, as witness the contented herds of Jerseys and Guernseys which today predominate over the native breed.

Careful management is needed to extend the grazing season on these permanent pastures, to give full measure during the summer and allow a surplus to be cut for silage or dried grass for the winter. Such management includes the use of fertilizers—particularly nitrogen, which is always the vital factor for increased production.

IMPERIAL CHEMICAL INDUSTRIES LIMITED, LONDON, S.W.1.

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